

Data Processing Group

Business Equipment Manufacturers Association
235 East 42nd Street, New York 17, New York — MUrray 7-5935

February 4, 1963

MEMORANDUM TO: DPG Advisory Committee on Plans and Policy
OMG Advisory Committee on Plans and Policy

FROM: C. A. Phillips, Director, Data Processing Group
C. E. Ginder, Director, Office Machines Group

SUBJECT: Proposed American Standard Code for Information Interchange

The News Bulletin of February 1, which you should have received today, carries an account, on page one, of the X3 meeting of January 24, 1963 at which it was voted, by a 2 to 1 majority, to transmit the pASCII directly to ASA without recommendation of the sponsor. The undersigned have discussed, with a number of BEMA member company representatives, various courses of action that were open to the sponsor. The general consensus seems to be that BEMA should not make a request for a hearing by the Miscellaneous Standards Board with the thought that this would put the manufacturers in a bad light with the user and general interest group. At the same time, it is believed incumbent on the sponsor to be sure that the position of the BSRB, taken at the January 4 meeting of that body, be made very clear before the Miscellaneous Standards Board. Also, there did not seem to be a feeling that there is a need to convene the BSRB again since there has been no change in circumstances that would alter the position taken at the January 4 meeting.

We have, therefore, developed the enclosed letter for joint signature as co-chairmen of the BSRB, addressed to ASA. Without asking for a hearing, we have strongly suggested that such action appears to be indicated. You will note that the letter is dated February 8 and, in the absence of objection by members of the Advisory Committees of DPG and OMG, it will be released on that date.

CAP/mh
enc.

C. A. Phillips
C. A. Phillips, Director, DPG

C. E. Ginder
C. E. Ginder, Director, OMG

1/12/63
1/13/63
BEMA

BEMA

Published weekly by
BUSINESS EQUIPMENT
MANUFACTURERS ASSOCIATION
235 East 42nd Street
New York City 17, New York

NEWSBULLETIN

February 1, 1963

X3 Committee Votes Send pASCII to ASA

At a meeting of the ASA X3 Sectional Committee on Computers and Information Processing held January 24th at BEMA Headquarters, it was voted by a two-to-one majority to transmit the proposed American Standard Code for Information Interchange directly to ASA without the recommendation of the sponsor, BEMA. Pursuant to the mandate of the Committee, the Chairman delivered the pASCII to Vincent G. Grey, representing ASA, in the presence of the Committee. As indicated by the Committee vote, the pASCII has been a controversial subject. At the September 10th meeting of X3, it was voted twenty to four to send pASCII through the Sponsor to ASA for approval as an American Standard. BEMA formed and convened
(Continued on Page 2)

Business Equipment Users, Makers Will Hold Two-Day Work Session

Representatives of business equipment users and general interest groups will be guests Monday and Tuesday, March 25-26 at the Hotel Edison, New York, at a Standards Institute sponsored jointly by BEMA, the National Office Management Association, and the Engineers Joint Council. Some 40 top officials of companies and groups directly affected by the BEMA-sponsored standardization programs for office machines and electronic data processing equipment and systems, conducted through American Standards Association procedures, will be invited. Purpose of the two-day work session is to obtain better communications between the manufacturers and the users and general interest groups. BFMA, as sponsor of both the X3 and X4 standardization programs, also is seeking more participation in the standards' program subcommittees and working groups by users and general interest groups.
(Continued on Page 2)

12th Secretaries Week Set for End of April

For the 12th consecutive year, the last full week in April has been set aside for the observance of Secretaries Week. The 1963 dates are April 21 through April 27 with Wednesday, April 24 designated as Secretaries Day. Secretaries Week is sponsored jointly by BEMA and The National Secretaries Association (International) which has 23,000 members in 550
(Continued on Page 5)



ASA X3 DELIVERS STANDARD: Chairman of X3 delivers proposed American Standard Code for Information Interchange (pASCII) to ASA Representative. l to r: R. E. Blue, (X3.2); Henry Tholstrup, (X3.2); R. E. Utman, (Sec. X3); V. G. Grey, ASA; L. L. Griffin, Chrmn (X3.2); C. A. Phillips, Chrmn (X3); J. B. Booth, E. H. Clamons, (X3.2); J. F. Auwaerter, (X3.2).



ASA X4 HOLDS MEETING: Taking a break during sectional meeting were Harry C. Anderson, Clarence V. Kouba, W. W. Sturdy, James Vincent, Vincent Grey, John C. Kern, R. L. Fortune, Carl P. Ray, W. H. Burkhardt, John S. Voorhees, R. E. Utman, E. D. Spina, John E. Bartelt, Miss Ellen R. Timmons, W. Hanstein, C. N. Jorgenson, C. E. Ginder. — See Page 2

The Industry That Serves All Industry

First Meeting for ASA X4 Committee

The ASA X4 Sectional Committee on Office Machines Standards held its first meeting of the new year at BEMA headquarters, Tuesday, January 29, 1963. Highlighting the meeting was the acceptance of the X4 Sectional Committee for the full responsibility for the punched tape segment of I/O media.

Mr. Carl P. Ray, vice president of Royal McBee and the chairman of the X4 Sectional Committee, appointed William H. Burkhart, of the Monroe Corporation, as chairman of ISO TC/95 Working Group L, Office Machines - Electrical, and also chairman of the newly formed ASA X4-A8 subcommittee, Office Machines-Electrical. Mr. Burkhart holds the responsibility for the development of standards in this area both nationally and internationally.

Mr. V.S. Johnston, of the Victor Comptometer Corporation, was named chairman of the ASA X4-A2 Subcommittee, Adding and Calculating Machines, as a replacement for Mr. Burkhart who resigned as chairman of this subcommittee to take up his new duties.

Mr. Harry C. Anderson, president of BEMA and a member of the ASA Board of Directors, was in attendance and told the group his responsibilities to both ASA and BEMA pertaining to office machines standards.

The Committee approved the recommendation of the OMG director, Mr. C. E. Ginder, for a jointly sponsored Standards Institute to further orient and renew interest of the user and general interest groups in the office machines standardization program.

The BEMA News Bulletin is published weekly by:

Business Equipment Manufacturers
Association
235 East 42nd Street
New York 17, N.Y.

President Harry C. Anderson

All Material for inclusion in the News Bulletin must be received by 5 p.m. on the Tuesday preceding the date of publication.

X3 MEETING

(Continued from Page 1)

a Standards Review Board which at its' first meeting voted to return pASCII to X3 for further work in adopting it to media, i.e., paper tape, punched cards and magnetic tape; and also to consider de facto standard codes for recognition as American Standards.

The latter recommendation of the BEMA Standards Review Board appeared to be in conflict with an interpretation of ASA Regulations, and at a second meeting of BSRB on January 4th, the Sponsor withdrew the recommendation on de facto standards but again expressed the view that submission of pASCII to ASA is premature, and that X3 should institute a scheduled program to develop adaptations of the code to paper tape, punched cards and magnetic tape. This position (which was not unanimous) was based on the concept that the code will be universally useful only when it can be adopted to common methods of machine to machine communications.

On the international scene, a Draft Proposal for 6 and 7 bit coded character sets for information interchange, based on the same code structure as the pASCII, was accepted by TC97 at the Paris October 1962 meeting for circulation to member countries for study and comment, as the second step to becoming an "ISO Recommendation" by majority vote.

Under ASA procedures, the pASCII will now go before the ASA Miscellaneous Standards Board for their consideration and determination as to whether or not a "consensus" exists for adoption of the code as an American Standard. Final action is represented by a review of the recommendation of the Miscellaneous Standards Board by the ASA Board of Review.

To bring out all the facts bearing on the case, either board may hold a hearing and ask the different parties at interest to appear and testify. On routine matters the action by both boards would be completed in about six weeks but the controversial character of the pASCII makes it probable that a longer period will be required for final determination.

PERT Package Coming For Honeywell 400

Honeywell Electronic Data Processing has announced development of a PERT package for use with the Honeywell 400 computer, and says the package will be available to users in the third quarter of this year.

The new PERT package will make it possible for up to 700 events and 900 activities to be handled by a Honeywell 400 with a basic 2K memory configuration, the company said. Additional events and activities can be processed on systems with larger memory capacities. The PERT program is geared to process randomly numbered events. (Events refer to the start or completion of a task; activities are defined as the time and effort it takes to progress from one event to another using the PERT technique.)

The input/output formats of the new package are identical to Honeywell 800 PERT statements, permitting simplified interchangeability from H-800 to H-400 processing. The Honeywell 800 system has had a PERT package since the third quarter of 1962.

Basic Honeywell 400 configuration required for using the PERT package is a central processor with 2K memory, 5 magnetic tape units (4 tape option), a high-speed printer and a card reader.

STANDARDS FORUM

(Continued from Page 1)

The program will be developed around the theme: The Users Stake in Standards.

Initial planning for the program was launched at BEMA headquarters at meeting of BEMA group directors and officials of NOMA and EJC. Those attending were Charles E. Ginder, OMG director; Charles A. Phillips, DPG director; Harry C. Anderson, BEMA president; W.T. Cavanaugh, executive director, and W.H. Latham of NOMA; L.W. Lynett of IBM and director of NOMA's administrative services; Leroy K. Wheelock, secretary of the Engineers Joint Council, and Richard L. Waddell, BEMA director of public relations.

bema News Bulletin

AMERICAN STANDARDS ASSOCIATION

INCORPORATED

10 East 40th Street

New York 16, N. Y.



Handwritten signature: J.S.A. with arrow pointing to BEMA

(COPY)

Business Equipment Manufacturers Association

Data Processing Group
235 East 42nd Street
New York 17, N. Y.

MC 4445
January 28, 1963

January 24, 1963

Handwritten: Transmitted 4:00 pm

Mr. R. E. Gay, Managing Director
American Standards Association
10 East 40th Street
New York 16, N. Y.

Dear Mr. Gay:

The enclosed (1) proposed American Standard Code for Information Interchange and attached documentation of record is forwarded in accordance with ASA procedure for consideration by ASA.

Also enclosed (2) is a statement of the X3 vote of record on this proposal as an American Standard.

Finally, and also enclosed (3) are the X3 motions of action of January 24, 1963, directing immediate transmittal of the proposal for ASA consideration.

The sponsor recommendation on approval as of January 4, 1963, is enclosed as it pertains.

Sincerely,

/s/ C. A. Phillips
X3 Chairman

CAP/moc

cc: X3 Membership
BEMA/DPG Director

- Encl. 1. Materials on Proposed American Standard Code for Information Interchange (ASCII)
2. Record of X3 vote on motion of September 10, 1962
3. X3 motions of action of January 24, 1963
4. Sponsor's recommendation of January 4, 1963

MC 4445
January 28, 1963

ASA Note: This submittal is being referred to the Miscellaneous Standards Board for action, and has been duplicated for Standards Council and officers of other standards boards as well. A copy of the proposed standard is on file in the ASA office, and is not enclosed with this MC.


V. G. Grey, Secretary
Miscellaneous Standards Board

JS

MC 4445
Enclosure 2

December 5, 1962

Vote of the X3 SECTIONAL COMMITTEE on the
PROPOSED AMERICAN STANDARD CODE FOR INFORMATION INTERCHANGE

The following is the vote recorded for the ASA X3 Sectional Committee on Computers and Information Processing on the September 10, 1962 question of approval of the proposed American Standard Code for Information Interchange (X3.2/13 of Sept. 10, 1962).

	<u>Approve</u>	<u>Disapprove</u>	<u>Abstain</u>
<u>USER GROUP</u>			
American Bankers Association	X		
American Gas Association & Edison Electric Institute	X		
American Petroleum Institute			X
Air Transport Association	X		
General Services Administration	X		
Insurance Accounting & Statistical Association	X		
Joint Users Group	X		
Life Office Management Association	X		
National Retail Merchants Association			X
Subtotal	7	0	2
<u>GENERAL INTEREST GROUP</u>			
American Institute of Electrical Engineers	X		
Association for Computing Machinery			X
Association of Consulting Management Engineers		X	
American Management Association	X		
Data Processing Management Association	X		
Department of Defense	X		
Electronic Industries Association		X	
Engineers Joint Council	X		
Institute of Radio Engineers	X		
Telephone Group	X		
Subtotal	7	2	1
<u>MANUFACTURERS GROUP</u>			
	6	2	2
GRAND TOTAL	20	4	5

MC 4445
Enclosure #3
January 24, 1963

X3 MOTIONS OF ACTION OF JANUARY 24 1963

At the X3 Sectional Committee meeting of this date, the following motions were enacted:

MOTION: X3 reaffirms its position that the proposed American Standard Code for Information Interchange (pASCII) be forwarded to ASA and requests the Chairman to do so without further delay.

Motion made by F. White of ASA

B Duly seconded, a roll call vote was asked and recorded as follows:

VOTE: Yes - 16
No - 8) passed 3:10 pm

USER GROUP:

ABA Yes
AGA&BBI Yes
API Yes
ATA Yes
GSA Yes
I&ASA No
LOMA Yes
NRMA Yes
JUG Yes

GENERAL INTEREST GROUP

AIBE - Yes
ACM - Yes
DOD - Yes
BIA - No
EJC - Yes
IRB - Yes
TG - Yes

MANUFACTURERS GROUP

Yes - 2
No - 6

By duly approved subsequent motion, the X3 Secretary was instructed (vote: Yes-14 No-7) to transmit the documentation of the proposed standard to ASA immediately.

passed 3:15 pm

also by F. White

MC 4445
Enclosure #4

Data Processing Group

bema

Business Equipment Manufacturers Association
235 East 42nd Street, New York 17, New York - MURRAY HILL 7-5969

January 31, 1963

BEMA STANDARDS REVIEW BOARD

DRAFT MINUTES

Second Meeting - January 4, 1963

SUMMARY

It was agreed that the purpose and main subject of this second BSRB meeting was the proposed American Standard Code for Information Interchange (pASCII) and, as a result, the DPG would chair and administer this meeting. Attendance and the name of the individual voting for each company represented was recorded. The draft agenda was modified to include an item on voting procedures, and accepted. A lengthy discussion of procedures resulted in adoption of the same rules as were defined and used at the first meeting of the BSRB, October 31, 1962, and the formation of an ad hoc committee to define permanent rules of order and procedure for future recommendation to the BSRB. Pertinent events since the first BSRB meeting were reviewed and, in particular, the correspondence with ASA on policy regarding conflicting standards proposals. Consistent with the Joint Steering Committee (X3-X4-X6) determination of December 19, 1962, it was decided that the recommendation of the first BSRB meeting was not in accordance with ASA policy. A new sponsor's recommendation on the pASCII was then developed, and stated as follows:

"The sponsor accepts the principle of a single code for information interchange. This code will be universally useful only when it can be adopted to the common methods of machine to machine communication, i.e., paper tape, punched cards, and magnetic tape. The sponsor, therefore, believes submission of the pASCII to ASA is premature. It is recommended to X3 that they institute a scheduled program of developing such adaptations with the objective of submitting to ASA a family of pASCII codes by the end of 1963, that will meet the needs of the industry and that X3 provide the organization and manpower needed for this task."

ie - record in media

This position was adopted by a vote of 12:3 as the sponsor's recommendation on the pASCII as of January 4, 1963. The means of communication of this position to ASA and X3, and of its implementation, was then assigned to the DPG Engineering Committee, and the meeting adjourned.

Passed by X3.2 // Y N A
8/0/2 - IBM
MON ROC

26

2

X3.2 recommends that X3 reject the recommendation of the BEMA Standards Review Board, to hold the proposed American Standard Code for Information Interchange (ASCII) until media standards are developed. The following is in support of the X3.2 recommendation:

1. Systems engineering and "software" design, which must precede the development of hardware, would benefit immeasurably if the proposed ASCII were to proceed to an American Standard.
2. The groups charged with the responsibility for media standards would have a single, common purpose, viz., the implementation of a single American Standard Code for Information Interchange if the proposed ASCII were to proceed to an American Standard.
3. Simultaneously with the development of media standards, there would exist the important feedback from system engineering, which is vital to the generation of the most optimum media standards, if the proposed ASCII were to proceed to an American Standard.
4. Delay in the transmission of the proposed ASCII to the ASA Miscellaneous Standards

Board will encourage any who are so motivated to delay and if possible prevent the implementation of the proposed ASCII in media, thereby defeating the efforts of the many to bring order out of the present chaos in information interchange.

5. Transmittal of the proposed ASCII to the ASA Miscellaneous Board would demonstrate the U.S. support for the 7-bit set of Proposal B of ISO TC/97 SC 2, thereby eliminating any doubts as to the position and intent of the U.S.



NMAH 3/10/4
photo caption

ASA X3 DELIVERS STANDARD: Chairman of X3 delivers proposed American Standard Code for Information Interchange (pASCII) to ASA Representative. l to r: R. E. Blue, (X3.2); Henry Thol-



DEPARTMENT OF THE NAVY
NAVY MANAGEMENT OFFICE
WASHINGTON 25, D. C.

DPSD:LLG:ef
5 February 1963

MEMORANDUM FOR X3.2 MEMBERS, ALTERNATES, AND CONSULTANTS

Subj: ASA Subcommittee X3.2 Organization and Responsibilities

The ASA Sectional Committee X3 at the January 24-25, 1963 meeting approved a number of actions that concern X3.2. These actions included:

- a. Forwarding of the proposed ASCII directly to the ASA.
- b. Assignment of responsibility for code representation in media to X3.2.
- c. Direction to X3.2 to concentrate on representation of the proposed ASCII.

The subject of X3 organization and Joint Working Groups for Input/Output media was referred to an ad hoc group for recommendations.

Other actions taken by X3 will not, I believe, have as immediate an effect on X3.2.

In view of the above X3 actions, I propose to reactivate, effective immediately, the following Task Groups:

- a. X3.2.1 - Magnetic Tape
- b. X3.2.2 - Perforated Tape
- c. X3.2.3 - Punched Cards

These Task Groups, you will recall, were established in the Fall of 1961. They were later merged into the Joint Task Groups for Input/Output Media, however, no action was apparently taken to abolish them. John Auwaerter was, and remains Chairman of X3.2.2. I was, and will continue as Chairman of X3.2.3. Ted Bonn was Chairman of X3.2.1; hence, a new Chairman must be appointed for this Group.

I also propose, subject to X3.2 approval, that two additional Task Groups be established to be effective at the next meeting as follows:

- a. X3.2.5 - Related Subsets
- b. X3.2.6 - Definition of Control Characters

Two motions were approved at the January meeting to establish: (1) a membership group and (2) an international correspondence group. I believe these are continuing tasks more appropriately handled by permanent or standing groups rather than by Task Groups, which are usually formed to perform a specific task. I, therefore, propose to establish two panels as follows:

- a. Membership panel
- b. Correspondence panel

I think it is appropriate that the X3.2 International representative be the chairman of the correspondence panel.

Will you please indicate the Task Groups in which your organization is interested in participating. A list of tentative titles and scopes is attached to help you decide. I would like to have your reply prior to the February 26, 1963 meeting if possible. In so far as practicable, concurrent Task Group meetings are suggested, either immediately preceding or following X3.2 meetings. A rule was previously adopted that the Task Group Chairmen should be members of X3.2. I suggest interpreting this as including active alternates.

The position of the parity bit in perforated tape is a subject in immediate need of attention. In so far as I am aware, there is no problem regarding the physical aspects of 1 inch paper tape. I assume, therefore, that the drafting of a recommendation can be undertaken when code representation agreement is reached.

In punched cards, a meeting of the JTG/PC has previously been scheduled for March 6-7, 1963 at Dayton, Ohio. I propose that X3.2.3 will meet jointly with the TR-27 PC Group through this meeting and perhaps later as necessary until the future of the JTG/IO media is clarified.

Magnetic tape code representation has been under active discussion in X3.2 and should continue under X3.2.1.

Joint meeting of X3.2 code representation task groups, and their counterpart physical and electrical media groups will no doubt be necessary from time to time.

I was requested to provide a meeting schedule through May 1964 on very short notice. The attached schedule is the result.

L. L. Griffin
L. L. GRIFFIN

Enclosures

3/10/64
NMAH

ASA Subcommittee X3.2 Organization
Task Groups
Suggested Identification and Scope

- X3.2.1 - Code Representation/Magnetic Tape
- SCOPE - Develop recommendations for standard methods of representing coded character sets in magnetic tape medium for information interchange.
- X3.2.2 - Code Representation/Perforated Tape
- SCOPE - Develop recommendations for standard methods of representing coded character sets in perforated tape medium for information interchange.
- X3.2.3 - Code Representation/Punched Cards
- SCOPE - Develop recommendations for standard methods of representing coded character sets in punched card medium for information interchange.
- X3.2.4 - Character Assignments/Unassigned Area (Proposed ASCII)
- SCOPE - Study and make recommendations regarding the assignment of characters in the "UNASSIGNED" area of the proposed ASCII exclusive of the four highest order positions in the set.
- X3.2.5 - Coded Character Subsets and Applied Character Sets Related to the proposed ASCII.
- SCOPE - Study the need for coded character subsets logically related to the proposed ASCII and where needed make recommendations for such logically related subsets. Study the need for definition of applied standard character sets or subsets and make recommendations as found appropriate to facilitate the interchange of information within and between information processing systems.
- X3.2.6 - Definition of Control Character Functions (proposed ASCII)
- SCOPE - Study the purpose or function of control characters included in the proposed ASCII, and make recommendations for such definitions as found appropriate to facilitate the interchange of information within and between data processing systems including associated transmission facilities.

ASA X3.2 MEETING SCHEDULE

<u>DATES</u>	<u>LOCATION</u>	<u>-----ORGANIZATION UNIT-----</u>										<u>Calendar Days</u>
		X3.2	X3.2.1	X3.2.2	X3.2.3	X3.2.4	X3.2.5	X3.2.6				
Jan 22-23, 1963	BEMA	X	X					X				2
Feb 26, 27, 28, 1963	BEMA											3
March 6-7, 1963	Dayton, Ohio											4
April 1, 1963	Phoenix		X	X	X	X	X	X	X	X	X	4
May 6, 1963	BEMA		X	X	X	X	X	X	X	X	X	4
June 10, 1963	Wash.		X	X	X	X	X	X	X	X	X	4
July 22, 1963	BEMA		X	X	X	X	X	X	X	X	X	4
Sept. 23, 1963	BEMA		X	X	X	X	X	X	X	X	X	4
Nov. 4, 1963	Las Vegas											4
Dec. 16, 1963	BEMA											4
Jan 27, 1964	BEMA											4
March 9, 1964	Wash.											4
April 13, 1964	BEMA											4
June 1, 1964	BEMA											4

bema

Business Equipment Manufacturers Association
235 East 42nd Street, New York 17, New York — MUrray Hill 7-5969

February 8, 1963

FOR INFORMATION ONLY

Mr. Roger E. Gay
Managing Director
American Standards Association
10 East 40th Street
New York, N. Y.

Dear Mr. Gay:

The proposed American Standard Code for Information Interchange (pASCII) was forwarded January 24, 1963 direct to ASA by Sectional Committee X3 under the provisions of ASA Procedure 212, without sponsor recommendation. This letter is to present the sponsor's position on the proposal.

At the meeting of September 10, 1962, Sectional Committee X3 voted to instruct the sponsor to forward the pASCII to ASA. Sectional Committee X4, at its meeting on September 14, 1962, expressed opposition to the pASCII. Since BEMA sponsors both Sectional Committees, it was necessary to resolve these conflicting positions and to develop, on behalf of the sponsor, a recommendation as to proper action on the pASCII. For this purpose, the Board of Directors of BEMA, on September 18, 1962, established the BEMA Standards Review Board comprised of members from the DPG and OMG Engineering Committees and gave this Board full responsibility to take final action on standards matters on behalf of the sponsor.

At the first meeting of the BEMA Standards Review Board (BSRB) on October 31, 1962, it was voted to:

1. request that X3 and X4 propose a de facto standard or standards for consideration concurrently with proposals for the pASCII standards expressed in media;
2. request the Joint Steering Committee of X3, X4 and X6 to recommend ways of accomplishing this most expeditiously; and
3. authorize the BEMA/DPG Director to write to ASA advising of this action

In a letter dated December 5, 1962, addressed to the Managing Director of ASA, the BEMA/DPG Director advised of the action of the BSRB and requested written official ASA statement on certain questions and situations. The answer, dated Dec. 21, 1962, indicated, among other things, that ASA would not knowingly approve a standard that recommends, on an equal footing, two conflicting practices, citing a specific prohibition against "the promulgation of conflicting standards" in The Constitution of ASA (Section X2.1). It appeared that part of the action of the BSRB of October 31 was in conflict with this interpretation of ASA regulations. Therefore, a second meeting of BSRB was convened on January 4, 1963, at which the matter was again considered in the light of the letter from ASA. The sponsor's new recommendation on the pASCII, which differed from the previous action only in elimination of the request for concurrent consideration of de facto standards, was developed and stated as follows:

"The sponsor accepts the principle of a single code for information interchange. This code will be universally useful only when it can be adopted to the common methods of machine to machine communication, i.e., paper tape, punched cards, and magnetic tape. The sponsor, therefore, believes submission of the pASCII to ASA is premature. It is recommended to X3 that they institute a scheduled program of developing such adaptations with the objective of submitting to ASA a family of pASCII codes by the end of 1963, that will meet the needs of the industry and that X3 provide the organization and manpower needed for this task."

This position was adopted by a vote of 12:3 as the sponsor's recommendation on pASCII as of January 4, 1963. This recommendation was presented to X3 at the meeting of January 24, 1963, but was rejected.

The provisions of ASA regulations, as stated in PR 27, Section 9.12.3, provide that the technical qualifications of a proposed standard be vouched for by one or more competent bodies to safeguard the judicial character of ASA approval. The recommendation of the BSRB of January 4, 1963 above-quoted indicates the question on the part of the sponsor as to the technical sufficiency of the proposal in the absence of related codes expressed in the media of paper tape, punched cards and magnetic tape.

Should a hearing be called by the Miscellaneous Standards Board, the sponsor will be glad to arrange for witnesses to appear in behalf of the sponsor's position.

CAP/mh

By: *C. A. Phillips*) CO-CHAIR
C. A. Phillips) BSRB
C. E. Ginder)
C. E. Ginder)

310/4
NMAH

February 11, 1963

MR. C. E. MACON
Burroughs Corporation
Electrodata Division
460 Sierra Madre Villa
Pasadena, California

Dear Chuck:

I have enclosed a photograph taken when the X3.2 code proposal was officially transmitted from the X3 Section Committee to the ASA.

I am sure you know most of the people in the picture but just to refresh your memory they are, from left to right: Bob Blue of IBM, Henry Tholstrup of Friden, Dick Utman of BEMA, Vince Grey of ASA (receiving the document), Len Griffin of Navy, Charlie Phillips, Chairman of X3 (transmitting the document), John Booth of Teletype, Eric Glamons of Univac and, of course, yours truly.

"It was a long hard fight, Mom, but we won." We spent a year developing the code and a year fighting it through, and I suspect we can now look forward to a year of struggling out the implementation question.

I am sorry you missed the last year.

Yours very truly

ORIGINAL SIGNED BY
J. F. AUWAERTER
Director of Product Development

JFA:AC

Enc.

NMAH 310/4

cardium from C. A. PHILLIPS

Date _____

February 1, 1963

To John Currier

The grand legend, here is a
copy of the photo taken
at the X 3 meeting.
Also, a copy for
Chuck Hearn

1

berma



3/10/2

22/4/11

Henry
Tholstrup

Dick
Utman

Ume
Grey

Len
Grijfh

Charlie Phillips

John
Booth

Eric
Clanous



RB

ECMA

European Computer Manufacturers Association

ECMA STANDARD

for a

6 Bit Input/Output Character Code

This standard is numbered
ECMA-1. Free copies are available at ECMA,
European Computer Manufacturers Association
Rue d'Italie 11 — Geneva (Switzerland)

March 1963

ECMA 1
310/4

BRIEF HISTORY

A Technical Committee of ECMA met for the first time in December 1960, to prepare standard codes for Input-Output purposes.

Representatives of the following companies participated in the work of the committee :—

A.E.I. Ltd
Compagnie des Machines Bull
E.M.I. Electronics Ltd
N. V. Electrologica
English Electric Co. Ltd
Facit Electronics A. B.
Ferranti Ltd
IBM-WTEC
I. C. T. Ltd
I. T. T. Europe Inc.
Leo Computers Ltd
National Cash Register Company Ltd, representing
Elliott Bros. (London) Ltd
Ing. C. Olivetti & Co. S.p.A.
S. E. A.
Siemens & Halske AG.
Telefunken G.m.b.H.

The work has led to the production of this, the first ECMA Standard on Input and Output Codes. In addition, this Technical Committee has collaborated with the following organisations :

American Standards Association
International Organization for Standardization

This Code has been adopted as a Standard by the General Assembly of ECMA on March 29, 1963.

INTRODUCTION

1. The table in this standard presents a character set for general usage and includes letters, figures, punctuation marks, special symbols and controls, with their coded representations.
2. This coded character set may be used for the interchange of information among data processing systems and associated equipment. It may be regarded as a basic alphabet in the abstract sense.
3. This basic alphabet may be implemented in various media. For example, this could include transmission systems, punched tape and magnetic tape, and thus permit interchange of data to take place either indirectly by means of an intermediate recording in a continuous physical medium, or by local electrical connection of these various units (such as input and output devices and computers) or by means of data transmission equipment.
4. In the preparation of this character set, the requirements for graphics and controls in data handling and programming, in accordance with computer and ancillary equipment characteristics, have been taken into account.
5. This character set is the first of a family of sets. Higher-order sets will enlarge the repertoire for both "graphics" and "controls".
6. The means of implementing this code for transmission, for recording on physical media, and taking into account the need for error checking will be the subject of future standards.
7. This code is not intended to be used as a punched cards standard.

Character code for data interchange among data processing systems

						0	0	1	1	
						0	1	0	1	
						Column				
						Row				
b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	0	1	2	3	
0	0	0	0	0	0	0	F ₀ Space	0	Null	P
0	0	0	0	1	0	1	F ₁ (HT)	1	A	Q
0	0	0	1	0	0	2	F ₂ (LF) ①	2	B	R
0	0	0	1	1	0	3	F ₃ (VT)	3	C	S
0	1	0	0	0	0	4	F ₄ (FF)	4	D	T
0	1	0	0	1	0	5	F ₅ (CR) ①	5	E	U
0	1	1	0	0	0	6	SO	6	F	V
0	1	1	1	0	0	7	SI	7	G	W
1	0	0	0	0	0	8	(	8	H	X
1	0	0	0	1	0	9	)	9	I	Y
1	0	1	0	0	0	10	*	: ② ②a	J	Z
1	0	1	1	0	0	11	+	; ②	K	④ I
1	1	0	0	0	0	12	, (Comma)	< or CS ③	L	④ or ⑤
1	1	0	1	0	0	13	—	= or % ③	M	④]
1	1	1	0	0	0	14	.	> or & ③	N	Escape
1	1	1	1	0	0	15	/	? or ' ③	O	Delete

EXPLANATORY LEGEND

CR	Carriage Return	LF	Line Feed
CS	Currency Sign — For example : £, \$, etc.	NL	New Line
F	Function	SI	Shift-in
FF	Form Feed	SO	Shift-out
HT	Horizontal Tabulate	VT	Vertical Tabulate

NOTES ON THE TABLE

- ① The controls CR and LF are intended for printer equipment which requires separate combinations to return the carriage and feed a line.
As an alternative, for equipment which uses a single combination for a combined carriage-return and line-feed operation (called New-Line), NL will be coded at F2. Then F5 will be regarded as a Spare Control.
If the latter type of equipment has to inter-work with the former, it may be necessary to take steps to introduce the CR character.
- ② If 10 and 11 as single characters are needed (for example, for Sterling currency), they should take the place of : and ; respectively.
- ②a If quotation mark is required, it should take the place of colon.
- ③ Either of the two alternative symbols shown in each of these positions in the Table may be chosen; but this requires agreement between sender and recipient of data.
- ④ In those countries in which the alphabet includes more than 26 letters, but no more than 29, the positions indicated by ④ may be occupied by the additional characters of the extended alphabet.
- ⑤ If a 2nd currency sign is required, it should take the place of \.

* * *

The sequence of bit-numbers shown ($b_1, b_2, \dots$) corresponds to the normal binary weighting sequence and does not necessarily imply the sequence of use in media or on transmission lines.

EXPLANATORY COMMENTS ON THE CODE TABLE

These explanatory comments are not part of the Standard as such, but contribute to the understanding of the Table.

The generalised controls (F), have specific meanings shown against them in parentheses. These show the use of the controls in character-by-character printer equipment. In other types of equipment, different but related meanings may be associated with certain of these generalised controls, but this requires agreement between sender and recipient of data.

The following notes refer to items in the order in which they appear in the table:

F	A functional character which may have the combined or alternative meanings of a Format Effector or an Information Separator. A Format Effector is a functional character which controls the layout or positioning of data in input/output media. An Information Separator is a functional character used to separate and qualify data in a logical sense. A group of these characters is intended to be used in a hierarchical order.
Space	A non-printing graphic character normally used to separate words. It is also a Format Effector. The use of this character causes the printing position to move one position horizontally.
HT	Horizontal Tabulate. A Format Effector, the use of which starts the horizontal movement of the printing position. The position at which this movement stops is determined under separate control.
LF	Line Feed. A Format Effector which controls the movement of the printing position to the next printing line.
VT	Vertical Tabulate. A Format Effector, the use of which starts the vertical movement of the printing position. The position at which this movement stops is determined under separate control.
FF	Form Feed. A Format Effector which controls the movement of the printing position to the first printing line on the next form.
CR	Carriage Return. A Format Effector which controls the movement of the printing position to the first printing position on the <i>same</i> printing line.

- NL New Line. A Format Effector which controls the movement of the printing position to the first printing position of the *next* printing line.
- SO and SI Shift-out and Shift-in. The Shift-out character means that the characters which follow shall be interpreted as outside the normal set of characters until a Shift-in character is reached. The Shift-in character means that the characters which follow shall be interpreted as within the normal set of characters.
- CS Currency Symbol. The use of this character may vary from country to country. Its precise meaning requires agreement between sender and recipient of data.
- Null A character which may be inserted into or deleted from a stream of data without affecting the information content of that stream (i.e. without affecting either the message or its layout or the control of equipment).
- Escape A functional character which may be used for extension of the standard character set of the code by changing the meaning of the next single following character. The precise meaning of this following character therefore requires prior agreement between sender and recipient of data. The single character which follows Escape may be interpreted as a graphic or control character not included in the standard set. Alternatively, the meaning of this single character may be "Go into code X and stay in it". Used in this way, the pair of characters has had the effect of causing a locking shift to occur.
- Delete This character is used to cancel erroneous data. Its precise meaning requires agreement between sender and recipient of data.

ECMA

European Computer Manufacturers Association

ECMA PHILOSOPHY ON CODES

MARCH 1963

Free copies of this document are available at ECMA,
European Computer Manufacturers Association
Rue d'Italie 11 — Geneva (Switzerland)

ECMA 44
310/4

ECMA PHILOSOPHY ON CODES

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DEFINITIONS

For the purpose of this philosophy document the following definitions apply:

1. **CODE** A set of rules for representing data by bits (e.g. 6-bit code where each element of data is represented by 6 bits).
2. **CHARACTER** An element of data, represented in a given code by a fixed number of bits.
3. **CHARACTER SET** The complete group of characters associated with a given code.
4. **GRAPHIC CHARACTER** sometimes abbreviated to *Graphic*. A character which is intended to be printed.
5. **ALPHABET** All the letters. (Note that this is a different meaning from that used by the CCITT.)
6. **SYMBOLS** Graphic characters other than the alphabet and the numerals.
7. **CONTROL CHARACTER** sometimes abbreviated to *Control*. A character primarily intended for the separation of data or the control of peripheral machinery. The term is sometimes loosely used to mean all characters other than graphics.
8. **CODE COMBINATION** A unique arrangement of bits used to represent one character.
9. **COLLATE** For the purpose of this document the word Collate has been used in a special sense: To arrange items of data in a logical sequence.

1. INTRODUCTION

1.1 General

A technical committee of ECMA met for the first time in December 1960 to prepare standard codes for Input and Output purposes. The scope for this committee was defined as follows:

Definition of common character sets (including alphabets, numbers, punctuation marks, special symbols and controls) and their coded representation suitable for input/output media and data transmission in order to facilitate interchange of information between data processing equipment.

The work of this committee since the initial meeting has led to agreement on a 6-bit code. However, a 7-bit code was currently under discussion within ECMA and other organizations, and although this is still incomplete its relationship to the 6-bit code is such that they have to be considered together if a proper understanding is to be reached of the agreed 6-bit code. For this reason the Draft 7-bit code is appended as it currently exists in international discussions (Appendix B). In the event of modifications being made by the time it reaches an agreed form then certain statements in this document may need to be changed.

The philosophy underlying this work requires that the media with which these codes are to be used be considered subsequent to the codes themselves. This does not mean that the deliberations were so abstract as to ignore all the many facets of the problems associated with media, but it does mean that particular problems of any one medium were not allowed to place impossible restrictions on the code concept. It must be clear, therefore, that the 6 and 7-bit codes do not attempt to define at this stage the means by which the coded characters are recorded in particular media, neither do they attempt to define any means of error control such as parity. Subsequent standards will be required for implementation of these code standards in the various media.

No attempt has been made to standardize the internal code of processors; the design of the codes is intended for use as they stand at the interfaces of a central processor. This allows maximum efficiency of information interchange, by dispensing with code conversions at interfaces. In addition, however, the same codes or simply related versions, may be used in internal hardware design.

Although reference has been made to electronic data processing and data transmission, the requirements of other devices have been taken into account. Full consideration has been given to message producing, handling and receiving equipments such as typewriter-like devices and add-list machines, from which so much of the recorded data which may be processed by computers is originated.

The result of these considerations provides, we believe, the best compromise between conflicting demands, though it may not fulfil every requirement of any isolated problem. That it has been achieved at all is a proof of the willingness of

manufacturers represented within ECMA to subordinate sectional interests to the benefit of the industry as a whole including that of its users.

1.2 Development of Need for Standard

It is worthwhile to consider for a moment why this work was started in the first place since the reasons for preparing a standard frequently have great influence on the nature of the standard itself. In the past ten years, developments in data processing have been remarkable. Centralization of electronic data processing has brought about the need for direct interchange of information between systems differing in both design and location. It is clear, therefore, that wider usage of standard codes and character sets in installations throughout the world will bring increasing benefits in efficiency and economy. In the absence of a standard code, apart from the International Telegraphic Alphabet No. 2, frequent recourse has been necessary to changes in character representation, by hardware or otherwise, and to conversion from one medium to another. In many cases such solutions are impossibly expensive and this places limitations upon the full development of data processing systems.

In existing telegraphic systems, the available character repertoire is too limited, and the sequence of characters in binary code value is unsuitable, for use in the broader field of data processing. Furthermore, the development of more sophisticated data transmission systems to meet the requirement for a higher order of accuracy than is necessary for ordinary message transmission, has been restricted by the lack of an agreed code and character repertoire.

Our efforts have, therefore, been devoted to the development of a code or codes to satisfy the requirements of communication between data processing systems, and also of the systems themselves.

1.3 Why two codes ?

At this stage it is necessary to state why 6 and 7-bit codes are being adopted. Some of the reasons go back to the use of the 5-bit International Telegraphic Alphabet No. 2 which carried with it a number of restrictions and difficulties. Among these restrictions are the use of shifts for the separate representation of numerals and letters, and a limited character repertoire. It was also recognised that the number of graphic symbols required in data processing work has been steadily growing. It was essential as a minimum to move to a 6-bit code in order to provide within a single shift 64 combinations, which was an early requirement that within the standard each character and its corresponding code combination should stand by itself and not depend upon other characters for interpretation. Nevertheless, extensions of the repertoire and special meanings have been made possible by the use of the Shift principle and Escape. Since the number of bits used to represent a character has a marked effect upon the cost of equipment, the basic code agreed by ECMA is a 6-bit set.

It was, however, never intended that the work should end with the definition of a 6-bit set, since it was apparent that for certain requirements, 128 and even 256 combinations from 7 and 8-bit codes respectively would be necessary. Unfortunately, until recently, very little work had been carried out which would have been of assistance in adequately defining 7 and 8-bit codes. It did seem that 128 combinations available from a 7-bit set would satisfy the requirements for information interchange,

in cases where a 6-bit set was inadequate. It appeared, however, that the 256 combinations available from the 8-bit set would be sufficient for the foreseeable future. In any case, physical limitations of some media had to be recognised.

1.4 American Data Transmission Influence

Developments in the American Standards Association in connection with the provision of a large amount of keyboard equipment for message transmission purposes indicated fairly definitely the needs in a 7-bit set. Where a data processing installation requires the use of the whole of a 64 character repertoire (including space), then the transmission of such repertoire involves the use of additional transmission controls not available in the 6-bit code. This is not to say that the standard 6-bit code is unsuitable for transmission purposes, since by restricting the character repertoire to something less than 64, and using some combinations for transmission controls, an adequate, if less sophisticated, system is possible, and certain European manufacturers have direct interest in such systems. It must be understood that a 7-bit system will have advantages over a 6-bit system, but such advantages have to be paid for in a reduction in the effective transmission rate and increased equipment costs.

2. STRUCTURE OF 6-BIT CODE

2.1 General Considerations

Computer operations are simplified when classes of characters with like characteristics are easily distinguished. The codes, both 6 and 7-bit, are therefore designed to permit easy identification of classes of graphic and control characters, although there has to be some compromise here in that the miscellaneous printed symbols are not all contained in a single and readily identified section of the code.

Probably the least contentious point in the preparation of this standard was that the numerals 0-9 (extended when required to 10 and 11) should if possible be represented by their binary (i.e. binary coded decimal) values. However, consideration of the collating sequence requires that the word separator (space) be of a lower binary value than any other character and in particular lower than zero. It is this requirement which places the numerals in the second column of the 6-bit set instead of the first, the numeric value being represented by the four least significant bits. The collating consideration also requires special symbols commonly used as separators (i.e. , - , /) to have a lower binary value than both numerals and the alphabet. The controls collate lower than symbols mainly for ease in identification. The alphabet is arranged so that the codes assigned are in a continuous natural sequence increasing in binary value. This criterion prevents the interspersing of non-alphabetic characters within the alphabet. The order of the remaining characters at the bottom of the second column was not critical and was chosen so as to be consistent with the 7-bit code. (See also Section 4.4 "Keyboard Considerations".)

Initially it was also a criterion that the code construction should be such as to permit easy expansion and contraction between the 6-bit and other related codes by keeping intact each column of the code table. However, this aim has not been completely realised due to conflicts between requirements of the 6 and 7-bit codes.

In the 6-bit code 53 characters are graphics, 8 are controls and 3 (Null, Escape, Delete) fall into neither category.

2.2 Controls

In the 6-bit code, controls are grouped in the 8 positions of the code with lowest binary value. This makes it simple to distinguish them (by program input routine or otherwise) from other characters. They are thought of as combining two quite different but closely related requirements, by acting both as Information Separators to define the grouping of data within the processor and on media (e.g., End of Word, End of Field), and as Format Effectors, the functional controls required to operate input-output equipment such as paper tape readers and punches, typewriters and line printers (e.g., Line Feed).

In the 7-bit code there are sufficient combinations available to separate these two requirements and give each a unique combination. With the smaller 6-bit code where the two requirements are combined, the first six positions in the code table are labelled simply F_0 to F_5 together with one set of Format Effectors (those required by a character-at-time printer) as examples. The chart which is attached as Appendix A to this document, shows alternative applications for these six controls, applied to different types of equipment.

When the controls are used as Information Separators, it is desirable to have them in a hierarchical sequence. The sequence selected is that which places the commonest control F_0 in the position of lowest binary value, adjacent to some printed symbols. This juxtaposition facilitates exploitation of the principle of Open-Endedness (see Section 3.3).

Special attention has been given to the commonest control F_0 , which normally represents the word separator Space. This character not only has the dual role of Separator and Format Effector, but in some contexts can also be thought of as a non-printing graphic character. It is necessary to show why F_0 is allocated the all-zeros combination.

In 2.1 it was seen that Space must have a lower binary value than any printed character; to suit open-endedness it should have a lower binary value than any other control. These considerations push it to, or very close to, the lowest binary value of all, namely all-zeros. Although the all-zeros combination presents some transmission problems (see Section 2.3) two reasons require Space to be allocated to this combination. Firstly, it bears a simple relationship to the combination for 0 (zero) thus facilitating the suppression of non-significant zeros by bit manipulation. Secondly, it was thought to be desirable to anticipate the possible requirement of compatibility with punched-card codes. Here, the all-zeros (no-holes) must represent Space so that pre-punching of data in part of a card leaves the remainder of the card unpunched.

Shift-Out and Shift-In are controls making possible enlargement of the character repertoire. The combinations following Shift-Out would generally be used to represent characters not included in the code, but certain combinations (e.g. those for Space, Newline, and Horizontal and Vertical Tabulate) may have the same meaning in both shifts. The Shift principle may for example be used to introduce small letters in addition to capital letters.

A similar function could be performed by the use of Escape (see Section 2.4) but only at the expense of using a pair of characters for each change of shift.

Agreement is necessary between sender and recipient of data as to the precise meanings allocated to the combinations following a Shift-Out character.

2.3 Null

The first position of the third column has been allotted no usage as control or symbol in the code, primarily to meet a data transmission requirement.

With certain systems of transmission it is essential that the combination of all-zeros should not be used on the line.

However, for reasons given in Section 2.2 the all-zeros position has been allotted to Space. The combination for Null, differing in only one bit from all-zeros, has therefore been reserved so that by a single transposition, effective only on the transmission link, it can be used for Space and the all-zeros code avoided on the line.

If the Null combination is not required for this purpose it is envisaged that it could be used for a non-significant zero.

2.4 Escape

This character may be used to signify that the single succeeding character does not have its normal significance within the code. Thus a special meaning would be given to any *pair* of characters, of which the first is the Escape character. Such a pair can provide an additional character (control or graphic) or signify "go into another code and stay in it".

It is emphasized that each meaning attached to such a pair of characters must be agreed between originator and recipient of any message which uses the Escape concept. These meanings, however, may be independent of those chosen by any other users, and they do not need to be related in any way to the standard code.

Attention is also drawn to the fact that this use of Escape is not obligatory, because any originator and recipient of a message can decide that the character following Escape is not to be used in any special way but is to have its ordinary meaning in the standard code.

It is important that a printed representation is allocated for Escape. This will be defined later.

2.5 Delete

The combination allocated for Delete consists of all 'ones'. This choice was determined by the requirements of punched tape; an erroneous character can be overpunched with all holes (manually or by overpunching after a backspace function). In certain circumstances, however, the Delete character may alternatively be used to cancel the preceding character or group of characters, but this requires agreement between sender and recipient of data.

It is important that a printed representation is allocated for Delete. This will be defined later.

2.6 Graphics

Of the 53 characters available for graphics, 44 have been allocated uniquely to the characters most commonly required. It was not found possible to select unique usages for the remaining 9 combinations from the large number of less universal yet reasonably common characters. Alternate characters are therefore given in these positions, the user being free to make an independent choice in respect of each pair.

2.6.1 Common Printing Characters

Because of the common demand for them, the following symbols have been allocated unique combinations:

0 to 9 A to Z () * + , - . /

2.6.2 Special Alphabets

To make the standard suitable for countries using various Latin alphabets, the three combinations following those allocated to the English alphabet have been made available for additional letters. This is ideal for the Scandinavian countries whose alphabet consists of 29 characters, the first 26 being the English alphabet. However, whilst the positions in the code for the three extra letters are correct for collating purposes in Scandinavian languages, this is not necessarily so for some other alphabets and it may be necessary to introduce special collating sub-routines. Although Portuguese, Spanish and Turkish languages require more than 3 special characters, certain English characters are omitted so that the total does not exceed 29. The Scandinavian countries will use these combinations as follows:

Position	3/11	3/12	3/13
Danish	Å	Æ	Ø
Norwegian	Å	Æ	Ø
Sweden	Å	Ä	Ö

2.6.3 Currency Signs

A general term "Currency Sign" is indicated in the table. This is intended to be interpreted as the user requires. It may be £ or \$ or some other sign and if interchange of information is to take place each of the parties concerned must be aware of which symbol the other has chosen.

If two currency signs are required, a second code combination is allocated which is not available where extended alphabets are used.

2.6.4 Commercial and Programming Requirements

An important consideration is to provide graphics for general commercial use and for use with automatic programming techniques. The requirements for COBOL are not greatly different from those of general commercial data but ALGOL, being a scientific and mathematical language, has rather different needs. Nevertheless, an attempt has been made to include the essential symbols. Any deficiencies, particularly the rather extensive requirements of the full ALGOL set, have to be met by the use of the Escape technique, or other means of enlarging the repertoire, or higher order codes.

3. DEPARTURES FROM THE 6-BIT STANDARD

3.1 4-bit Subset

For certain simple accounting machines a 4-bit graphic subset is adequate. The code is designed so that such a set can easily be derived from the 6-bit set. Two such selections are as follows:

0 1 2 3 4 5 6 7 8 9 * + , - . /
0 1 2 3 4 5 6 7 8 9 10 11 , - . /

3.2 Variants

It was stated earlier that to achieve a 6-bit code certain compromises had been necessary. If the result fails to provide exactly those requirements of a particular user it has to be remembered that the advantages of operating within a standard will far outweigh the disadvantage of managing without some favourite symbol. Even so, a user may find himself unable to avoid the use of a certain symbol and the following guidance is offered in devising a suitable variant of the standard code.

It is claimed that within the confines of a 6-bit set, the characters and controls included in the standard code are suitable for the majority of the diverse applications. *The user must not move any character from the position defined in the standard to any other position, and a user failing to observe this rule will be considered as operating outside the standard.* Where a desired character is not already included in the standard it should replace a "weaker" character in the set (e.g. those which follow Z if not required for special alphabets). Although the risk of difficulty in the interchange of data is thus diminished, it is still present. Agreement is necessary between sender and recipient of data for any variant of the Standard.

3.3 Open-endedness

Reference was made earlier to the decision to centre the basic code on 6 bits. This presented a greater challenge than a decision to commence with 7 bits would have done, due to the conflicting demands on the limited space within the framework of a 6-bit code.

The 6-bit code therefore is essentially a compromise between many demands. In particular, since the inclusion of numerals and the alphabet (up to 29 letters) can hardly be contested, there is a conflict for the remaining combinations between the special printed characters (symbols) and the Controls. In the Standard an allocation of eight combinations has been made for Controls, this being a reasonable number for the majority of applications.

There are occasions when the eight Controls available are more than required. If at the same time the available special characters are insufficient the line which separates them might appear to be drawn in the wrong position. This has been met by arranging the order of the Controls so that those most frequently used have the lowest binary value and those used least have higher binary values which places them nearer to the symbols. Thus it is possible to dispense with a Control and replace it by a symbol without destroying the continuity of either group. (This is qualified by the presence of Shift-In and Shift-Out which although belonging within the Control group, may be retained when for instance Function F5 is dropped.)

The ability to move the dividing line between the Controls and symbols is known as "open-endedness". Like other variants of the Standard Code it can only be exploited by agreement between sender and recipient of data.

4. THE 7-BIT CODE AND ITS RELATIONSHIP TO THE 6-BIT CODE

It must be emphasized that the following section will require review after the publication of a 7-bit standard code.

4.1 Code Relationships

It will be apparent that both 6 and 7-bit codes have their uses according to particular requirements and considerable effort has been expended in the need to make these two codes compatible. To this extent the 7-bit code may be regarded as a super-set of the 6-bit code, or conversely the 6-bit code as a sub-set of the 7-bit code.

Apart from the additional 64 combinations available within a 7-bit code, there are differences in structure between the 6 and 7-bit codes. The 6-bit code is similar to the four centre columns of the 7-bit code. Different groups of four columns have been considered. The simplest relationship which could exist between the 6 and 7-bit codes is one where an extra bit is added to the smaller set. This would have had the effect of placing the four columns from the 6-bit set in the left-hand four columns of the 7-bit set. This fails to eliminate the complications that for certain data transmission systems the all-zeros combination, representing the Space character, is not an acceptable character. (See para. 2.3) Alternatively, the right-hand four columns could be used in the 7-bit code to contain the 6-bit sub-set. This suffers from the defect (among others) of losing at least two printing graphics since the all-ones is by common acceptance in certain media, particularly paper tape, reserved for Delete (see para. 2.5); the combination immediately prior to the Delete character is also by common acceptance reserved for Escape. For these and other reasons, the centre four columns were chosen, despite consequential difficulties in the logical transformation between the two codes.

Some suggested rules for conversion between the 6 and 7-bit codes are given in Appendix C.

4.2 Graphics

ECMA has not yet considered the selections and placing of graphics for the 7-bit set. Consideration has only been given as far as it impinges directly on the 6-bit set. The additional graphics having unique code combinations in the 7-bit set are:

! " # @ ↑ ←

Considerable thought has been given to the contenders for inclusion in the two right-hand columns. Where lower case letters are required and are not obtained by the use of Shift working they will fall naturally into these columns. Other thoughts are being given to the requirements of further sets of symbols, particularly for scientific programming languages, but no conclusions have emerged yet. It appears likely that until a full 8-bit code is defined there will be several alternative sets for this area of the table.

For line printers where a 64-character repertoire is available, a likely choice will be the four central columns of the 7-bit set. This is known as a dense graphic sub-set of the draft 7-bit code, where dense means not interrupted by Controls (Space in this context is regarded as a non-printing graphic).

4.3 Controls

It can be seen that the most obvious difference between the 6-bit code and the four centre columns of the 7-bit code lies in the presence of certain Controls within the former. These are the group of eight at the lower binary end. The 7-bit code

has four such groups of controls all of which have lower binary values than the graphics. The additional combinations made available by the use of a 7-bit code thus permit unique Controls to be allocated to particular combinations, whereas the 6-bit code relies upon the multiple but related significance of the single group of Controls (See Section 2.2).

4.4 Keyboard Considerations

The requirements of keyboard-operated machines have directly affected the 6-bit code to a limited extent only. They played a large part, however, in the placing of characters in the 7-bit table and thus effect the 6-bit, insofar as compatibility and interchange between the two codes are essential. This is because in attempting to match a 7-bit code to a keyboard it is necessary to associate three characters with some of the keys and to preserve a simple relationship between them.

Although there is no universal standard which defines the number of keys on keyboards and the pairing of particular characters on some of the keys, there is a certain uniformity between keyboards of different manufacturers, notably the number of 44 printing keys and those symbols paired with the numerals. Recognition of this had an effect on the standard codes, insofar as certain keys had to be associated with more than one character. Distinction between the two characters associated with one key is made by a special control key. In order to simplify the action of this control key the pair of combinations allocated to each printing key should differ only in one bit, and this always the same bit. It may be necessary to have a second control key with similar functions to the first to permit the association of three characters with certain keys. The effect of this is to place some important symbols in the upper half of the 7-bit code structure. Since these symbols are equally important in both the 6-bit and 7-bit codes, it is obvious that a further clash of interest arises since these positions are allocated to Controls in the 6-bit set.

The solution, again a compromise, is to arrange these symbols in order of importance and make the four in rows 4, 5, 6 and 7 of Column 2 of the 7-bit table interchangeable with the four in rows 12, 13, 14 and 15 of Column 1 of the 6-bit table.

Examples illustrating the alternative uses of Function characters

APPENDIX A

DRAFT ISO 7-BIT CODE TABLE

APPENDIX B

Notes on the Table

- ① The controls CR and LF are intended for printer equipment which requires separate combinations to return the carriage and feed a line.
As an alternative, for equipment which uses a single combination for a combined carriage-return and line-feed operation (called New-Line), NL will be coded at FE₂. Then FE₈ will be regarded as Back Space BS.
If the latter type of equipment has to inter-work with the former, it may be necessary to take steps to introduce the CR character.
- ② If 10 and 11 as single characters are needed (for example, for Sterling currency), they should take the place of: and; respectively.
- ④ In those countries in which the alphabet includes more than 26 letters, but no more than 29, the positions indicated by ④ may be occupied by the additional characters of the extended alphabet.
- ⑤ If a 2nd currency sign is required, it should take the place of \.
- ⑦ Reserved for future standardization for use as an Acknowledge signal.

APPENDIX C

CONVERSION BETWEEN 6 AND 7-BIT CODES

This Appendix sets out to discuss some of the problems of conversion between 6 and 7-bit codes. One system of rules for such conversions by logical methods is described. An attached chart illustrates the transpositions involved. Any reference to number of bits signifies data bits only, ignoring any form of error control.

Assuming that the interface at a computer is designed to accept the standard 7-bit code, then if a 6-bit punched tape, magnetic tape or data link is connected to this interface, the problems of expansion, although not insignificant, are reasonably straightforward. Essentially they require the eight Controls plus Escape and Delete to be modified in their bit structures.

However, the requirement of connecting a medium using 7 bits to an interface designed for 6 bits is a problem of greater complexity.

Combinations having no direct equivalent in the 6-bit code can be treated in one of three ways:

1. Steps are taken to ensure that they do not occur in the 7-bit stream.
2. They are suppressed in conversion.
3. They are handled by either the Shift or the Escape principle.

Where complete conversion is necessary from the 7 to the 6-bit code, it may be judged expedient to do this by table look-up rather than resort to somewhat complex hardware. However, circumstances may suggest a combination of the two methods as most economic.

Special logical conversion can occasionally be provided by a complete system without significant effect on its cost but if the conversion has to be effected at an inexpensive peripheral device, the cost of conversion may be excessive.

The following Rules for conversion do not claim to define the only method of handling this problem, but merely illustrate one possible method. Neither do they define the rules for contraction from a 7-bit code which has been expanded by use of the Shift or Escape principle, to the 6-bit code standard.

RULES:

In the following tests 0 represents either 0 or 1

1. 6 bit to 7 bit
 - (a) Space.
Test for 000000
If yes, convert to 0100000
and go to next character.
If no, go to (b)
 - (b) Format Effectors.
Test for 000000
If yes, convert to 0001000
and go to next character.
If no, go to (c)

This assumes that none of the Controls have been dropped in favour of additional symbols. (See notes on Open-Endedness). If transposition has been in a group of four symbols, then test is as follows:

Test for 000000

If yes, convert to 0001000

and go to next character.

If no, go to (c)

If transposition is not in a group of four symbols, then additional steps may be necessary.

(c) Escape and Delete

Test for 111110

If yes, convert to 1111110

and go to next character.

If no, go to (d)

(d) Commercial Symbols (alternatives)

Test for 011100

If yes, convert to 0100100

and go to next character.

If no, go to (e)

This assumes a group of four character alternatives have been used. If not, then additional steps may be necessary.

(e) Numerals and remaining Symbols in first two columns.

Test for 000000

If yes, convert to 0100000

and go to next character.

If no, go to (f)

(f) All other characters

Convert from 100000 to 1000000

and go to next character

2. 7 bit to 6 bit, where combinations which have no direct equivalent in the 6 bit code are not present in the 7 bit stream.

(a) Format Effectors, Shift-Out, Shift-In and Information Separators (if exclusive)

Test for 0001000

If yes, convert to 000000

and go to next character.

If no, go to (b)

This assumes that none of the Controls in the 6 bit code are being dropped in favour of additional symbols. (See notes on Open-Endedness.) If transposition is in a group of four symbols, then test is as follows:

Test for 0001000

If yes, convert to 000000

and go to next character.

If no, go to (b)

If other than four characters have been transposed additional steps may be necessary.

(b) Escape and Delete

Test for 1111110

If yes, convert to 111110

and go to next character.

If no, go to (c)

(c) Space

Test for 0100000

If yes, convert to 000000

and go to next character

If no, go to (d)

(d) Commercial Symbols (alternatives)

Test for 0100100

If yes, convert to 011100

and go to next character.

If no, go to (e)

This assumes a group of four character alternatives have been used. If not, then additional steps may be necessary.

(e) Numerals and remaining Symbols in third and fourth columns.

Test for 0100000

If yes, convert to 000000

and go to next character.

If no, go to (f)

(f) All other characters

Convert from 1000000 to 1000000

3. 7 bit to 6 bit, where combinations which have no direct equivalent in the 6 bit code must be suppressed in the collapse.

The following additional operations must be carried out prior to 2 (c)

Test for 000000

and 1100000

If yes, ignore and go to next character

If no, go to 2 (c)

4. 7 bit to 6 bit, where combinations which have no direct equivalent in the 6 bit code must be handled by the introduction of a Shift or Escape function.

The following additional operations must be carried out prior to 2 (c)

(a) Test for 000000

If yes, generate 000110 (Shift-Out)

or 111110 (Escape) and follow with character

converted to 000000

and go to next character.

If not, go to (b)

(b) Test for 1100000

If yes, generate 000110 (Shift-Out)

or 111110 (Escape) and follow with character converted to 100000

and go to next character

If no, go to 2 (c)

In the foregoing, it is necessary to keep a record of the use of 000110 (Shift-Out) and if the following character responds to Tests 4 (a) and (b) then the Shift-Out character must not be generated. Conversely if the following character does not respond to Tests 4 (a) and (b) then 000111 (Shift-In) must precede the subsequent conversion.

An alternative method of handling combinations, the significance of which have no direct equivalent in the 6 bit code is to convert to a special character carrying the meaning of "foreign".

CONVERSION BETWEEN 7 & 6-BIT FORMS OF ISO DRAFT PROPOSAL CODE

7-bit Form of Code

	0	1	2	3	4	5	6	7
0			Space					
1								
2								
3								
4			①					
5				Numerals				
6					Capital Letters			
7						Capital Letters		
8							Small Letters	
9								
10	Format Effectors	Information Separators	Special Symbols					
11								
12								
13				②				
14								
15								Escape Delete

6-bit Form of Code

	0	1	2	3
0				
1				
2				
3				
4				
5				
6				
7	Functions			
8				
9				
10				
11				
12	Special Symbols			
13				
14		③		
15				Escape Delete

Area ③ is compounded from ① and ②

1
310/4
NMAH

AMERICAN STANDARDS ASSOCIATION
INCORPORATED

10 East 40th Street
New York 16, N. Y.



SECTIONAL COMMITTEE CORRESPONDENCE

MEMORANDUM REPORT

March 25, 1963

TO: ASA Sectional Committee X3
FROM: C. A. Phillips, X3 Chairman
SUBJECT: ASA Miscellaneous Standards Board Hearing on pASCII - March 20, 1963

As you may know an open hearing on the pASCII was called for March 20, 1963 by the ASA/MSB responsible for its review and approval. This is an informal and unofficial report of the meeting.

Eleven of the twelve members of the Board were in attendance and the invited participants and observers included:

Invited:	X3 Chairman	- C. A. Phillips	Observers:	X3-EJC	- W. M. Carlson
	X3.2 Chairman	- L. L. Griffin		X3-DOD	- G. L. Bowlby
	Sponsor's Spokesman	- R. E. Utman		X3-GSA	- R. W. Raup
	pASCII Proponents	- B. W. Pollard*		X4-BEMA	- C. E. Ginder
				X4	- W. H. Burkhart
				X3.2	- J. B. Booth
				X3.2	- E. H. Clamons

*Represented F. C. White, X3-ATA, who was unable to attend

The Board first asked for a presentation of the sponsor's position, which was given by Mr. Utman from a prepared statement (see attached) inserted in the minutes. The EIA negative position was read by Mr. Phillips in the absence of EIA. The pASCII proponents' viewpoint was then asked for, and offered orally by Mr. Pollard, representing the absent Mr. White of ATA. These invited presentations took forty minutes.

The next hour was devoted to MSB questioning of the sponsor, proponents, X3 and X3.2 Chairmen, with brief statements accepted from GSA, DOD, and duPont. The Board had difficulty in understanding the difference in BEMA vote in X3 approving pASCII (6-2), and as sponsor in recommending against its adoption by ASA (2-8). They sought assurance that X3.2 was technically competent. X3.2 estimated that pASCII punched and magnetic tape media codes could be proposed by 1/1/64, but that a punched card proposal would take longer.

The Board also investigated the acceptability of four possible alternative actions to simple pASCII approval:

1. Adopt pASCII now, with X3 agreement on refinements needed and time limit for such.
2. Adopt pASCII now, instructing X3 to offer media interpretations on request.
3. Adopt pASCII now effective 1/1/64.
4. Reject pASCII until X3 approves a refined and less general scope statement.

To: BEMA Standards Review Board

March 25, 1963

- 2 -

Finally, the Board devoted a half-hour to deciding the action it should take on pASCII. This was open to observation. The main question was whether to ballot on simple acceptance of pASCII or on some alternative. ASA pointed out there was no precedent for a delayed date of effectiveness of a standard, for invocation of ASA Procedure 212 (prior to this X3 action with pASCII), or for an ASA Board overruling a sponsor's recommendation. The latter was of real concern. It was decided unanimously to continue the current mail ballot on the simple question of approval of pASCII. ASA requires 85% (5/6) approval to establish a standard (10 out of 12 in the MSB). An inconclusive and informal straw vote, conducted during the discussion, indicated majority approval of pASCII with 7 in favor, 4 opposed, 1 absent. Final ASA action rests with the ASA Standards Council and Review Board.

Next, in a closed session, the MSB considered the X3 recommendation to put input/output media standardization responsibility in X3. The recent and similar X6 and conditioned X4 recommendations were also reported. We are informed it was decided unanimously that the scope of X3 be interpreted to include input/output media for automatic data systems. ASA later offered two interpretations: (1) that this includes both electrical and non-electrical aspects of media standardization, and (2) excludes punched tape used exclusively for office machines. Exactly what this last item means is not clear. Although X4 had been asked to have representation at this meeting and did have such personnel present, no one from either X4 or X3 attended this last session or was questioned by the MSB on this point.

CAP:ror

Attachment: Sponsor's Presentation to ASA on pASCII of March 20, 1963

cc: X3.2 Subcommittee

C. A. Phillips, Chairman
ASA Sectional Committee X3

April 2, 1963

DIPL. ING. HERBERT WUSTENEY
Siemens & Halske
Hofmannstr. 51
Munich 25, Germany

Dear Dr. Wustenev:

I have spent some more time reviewing the code proposal you made on your visit with Mr. Zenner and myself. After quite a bit of thought and discussion with others I have come to the conclusion that the code proposal offers insufficient advantages over that currently before the ISO to warrant its introduction to the CCITT.

Frankly I see very little advantage in a 7-level code if only 48 characters (the right three columns) can be used in common between communicators and data processors. A 6-level code in which 48 characters are shared in common and in which the remaining 16 could be put to different use in the two separate areas of communication and data processing would serve almost as well. It would only be necessary in these remaining 16 to agree on the common use of five control codes (SPACE through WRU).

Your code proposal, I believe, offers no cost advantage to a teleprinter. Its use in such a machine involves all the costs of both a 4-row keyboard and a 7-bit transmission code without gaining the advantage of a 64 graphic printed set, nor does it provide common control codes for both teleprinters and data processing machines as offered by the ISO draft proposal 7-bit code.

You will find attached an expanded set of comments which are based on those that I gave you on your visit. I apologize for the fact that they are all adverse comments; however, they are the result of quite a bit of thought.

In still another document I have tried to answer the questions raised in your letter of March 5. If I can be of any further service, please write me. Also, if you have an opportunity I would appreciate your sending me a brief statement as to what advantages you feel your proposal has over the current ISO work.

Yours very truly

ORIGINAL SIGNED BY
J. E. WAERTER

JFA:AC

Director of Product Development

Enc.

ARM4H

300/4

COMMENTS ON 7-LEVEL CODE PROPOSAL

I have reviewed the 6- and 7-level code proposal dated January 25, 1963 by Siemens & Halske and offer the following comments:

1. The code proposal places emphasis on a simple relationship between a 6-bit set for data processing and a 6-bit set for telegraphy by placing these sets in a common 7-bit matrix in such a way that the two 6-bit subsets share the three high order octals (Columns 101, 110 and 111). The data processing subset is viewed to include the 100 octal column while the telegraph subset is viewed to include the 000 octal column. A copy of the code proposal is attached.
2. With this structure the teleprinter must be viewed as operating on the subset b₁ to b₆, assigning to those permutations in which b₆ and b₅ are both 0, the meanings contained in column 000 of the 7-bit set. From a teleprinter point of view this is perfectly feasible technically but has the following disadvantages:
 - a. If a simple b₅ bit shift is used on the keyboard, no graphic symbols would appear on the keytops above the numerals 0 thru 7. Thus, the keyboard would not look like any typewriter used generally in any country in the world today. If the keyboard bit shift is made more complex by, in addition to setting b₅ from 1 to 0, setting b₄ from 0 to 1, the "national characters" and the "?" will appear above the digit in the 0 thru 7 keytops. This can be done but it is more expensive than the simple b₅ shift. Also, if it is done, keyboard access to symbols (thru : would be awkward because they could be obtained either (i) from the keytops K thru N by exception to the b₄ shift rule, an added expense, or (ii) from the keytops C thru F, in which case these symbols would compete for keytop space with the controls, WRU thru FF.
 - b. The symbols (thru : are fairly important symbols in a type-writer keyboard and would not want to be dispensed with were an up-lo machine designed; but since they would appear most naturally on the keytops C thru F or K thru N, their generation by an up-lo keyboard would become either awkward for the operator through use of a "symbol" rather than a "case" shift key, or expensive from a mechanical logic viewpoint.
 - c. The symbol, comma(,), is awkwardly placed because it must either be generated by SHIFT P or allocated a keytop all its own.
 - d. Generation of control characters from the keyboard would most naturally come through causing the control key to set b₇ and b₆ from 1 to 0 as the keytops A through G are depressed. If this procedure is used, the keytops H through O are not easily usable for generation of controls since they would tend to generate national characters in the absence of special logic in the keyboard.
 - e. SPACE is all zeros (or "Blank") in the telegraph set.

3. From a computer point of view, I believe the proposal has the following difficulties:
 - a. There is no simple test to distinguish controls from graphics in the 7-bit set. Control is encountered (at least) whenever b_7, b_6, b_5 , and b_4 are 0000 (Space through Bell), whenever b_7, b_6, b_5, b_4, b_3 are 10000 (Space through LF) and whenever $b_7, b_6, b_5, b_4, b_3, b_2$ and b_1 are either 1000100 (WRU) or 1111111 (Delete).
 - b. The collating sequences of the special symbols differ from that found generally acceptable either in Europe or the United States. In addition, as I understand it, the symbols (= and : should have a binary value lower than the alphabet. Also, (should collate before).
 - c. Special symbols which are data delimiting in nature - (< >) etc., are not grouped and are not in any data delimiting sequence amongst themselves.
 - d. The data processing subset does not provide a 4-bit subset which meets the criteria expressed in either the United States or Europe. Nor does the 4-bit set contain the comma (,) or asterisk (*), both quite important characters.
 - e. The data processors are not provided HT and FF controls. These as well as VT are very useful and much desired by many processors. If the data processing manufacturer choose to make use of the controls HT and FF within his 6-bit main frame by means of a simple contraction from the 7 to 6 bit form, you will find that HT and FF replace [and < which would mean that these characters were lost while their opposite numbers] and > remained in the set.
 - f. Inclusion of 10 and 11 for Sterling areas will cause them to lose the "period" (or radix point) and the right parenthesis. Both are very important characters.
 - g. The Scandinavians will lose the collating sequence of their three extra characters if they are placed in the first column. I believe they actually collate after Z. If they are placed "below" Z, the important symbols (= and ' are lost.
 - h. Placing ESCAPE where it is, eliminates the easy possibility of having ESCAPE in the 4-bit set because it would contract upon 1 on a stripping of the four high order bits.
 - i. The set is wasteful because it assigns the same meaning to two permutations in the case of each of the five controls, SPACE thru WRU.
 - j. The 7-bit set does not provide the dense graphic subset desired by a number of United States computer manufacturers for print-out of binary 6-bit data (Dr. Neubauer of Lorenz might be consulted on this point).

3.

4. Finally, the proposal is so radically different from that being circulated in the ISO TC/97 that its consideration in that body would introduce at least a year's delay in the standardization process.

COMMENTS ON LETTER OF MARCH 5, 1963

The replies are numbered to correspond to the numbers of the comments.

1. There is no fundamental reason why two ESCAPES are necessary. It is simply that if one ESCAPE is defined among communicators and a completely different ESCAPE among data processors, the administrative problems would become much easier. The communicator does not want to tell the processor that he cannot agree and use ESCAPE conventions; but unless there are two ESCAPES provided, an ESCAPE used by a processor might unexpectedly cause a communication computer to switch in the middle of the message.
2. We believe it is necessary that ESCAPE be defined to mean only departure from the basic code. If we try to define fully all the different modes we would be operating in over the next fifty years, we would be tackling an impossible task; therefore, it is important not to allow the ESCAPE character itself to say anything about the characteristics or duration of the alphabet into which you arrive after receipt of the ESCAPE signal. Definition of this new domain is better handled by the next succeeding character(s) and as conventions in this regard are worked out they may well become the subject of further standardization.

I believe it would be an error to limit ESCAPE to only one character, not only because a survey among communicators and data processors in this country has already shown that we could almost immediately use up all 128 controls permitted by the single character ESCAPE but also because some people in the future might well wish to use the ESCAPE to signal departure to a completely foreign alphabet or even a foreign e.g. (analogue) signaling mode.

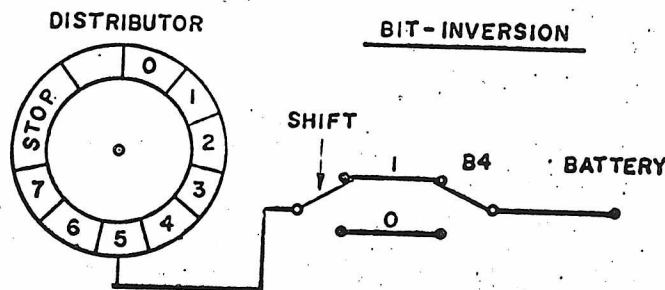
Much work is being done in this country on defining "open-ended" ESCAPE techniques which will permit immediate use of the concept but not block our future growth.

3. You may well be right in this comment. We have not yet worked out whether a lower case alphabet should be included within the unassigned area of the 7-bit code or be obtained from the SHIFT-OUT permutation. A lively discussion is going on in this regard. There is no clear cut conclusion yet. I personally feel that the results of our consideration will be that the ESCAPE will be limited to control definition and the SHIFT-OUT to definition of an alternative set of printing graphics. But whether this alternative set of printing graphics will be an upper case alphabet, an ALOGOE set, or a "do-it-yourself" set, I find it difficult to predict. When we come to a U.S. position I will let you know.
4. The printed signs [\] are not shown on the keyboard because we wanted to indicate the controls VT and FF on the keytops K and L. We are not willing to put three pieces of information on the same keytop and decided that it was more important to indicate the controls than these little used graphics. The symbol] was omitted

from the keytop M because of the omission of its corresponding symbol [. When an operator needs these symbols we can either supply a three section keytop or, more likely, give her appropriate verbal or written instructions. These symbols can be obtained from our keyboard by depressing SHIFT, K, L or M.

X On can be generated as CONTROL Q, though we chose not to clutter up our keyboard with this little-used control. The Acknowledge signal cannot be generated from our keyboard but is obtained through a "timed-open" by a relay.

5. I agree with you but the data processor wanted the signs , - . / to collate low with respect to the numbers. Actually the reversal of the fifth pulse has added less than fifty cents to the cost of our Model 33 keyboard because it was done with a simple pair of transfer switches as indicated below.



6. This would be true if it were not for the fact that we took advantage of the need to have a SHIFT key on both sides of the keyboard (which requires that we somehow link these SHIFT keys with a common code bar) by arranging the linking code bar to block depression of keytops like R. Note that this problem also arises in your code proposal.
7. We have set up our (64 character-monospace) page printers to print on bits b₁, b₂, b₃, b₄, b₅, b₇. Notice that we omitted bit b₆. Thus if the permutation b₇ - b₁ is 1110000 (in the "unassigned" area) is received by the printer, it will print P (whose code is 1010000). Thus if the unassigned area is indeed used for a lower case alphabet (so that 1110000 is "p") our 64 character-monospace printer would be completely compatible because it would print an upper case character (such as P) independent of the state of b₆. However, the upper-lower case printer would use b₆ to distinguish between the alphabetical cases and print accordingly.

We have arranged our page printers to suppress printing whenever bits b₆ and b₇ are SPACE or bit b₃, b₄, b₅, b₆, b₇ are MARK. Thus we will only print on the permutations in the four center columns and the unassigned area of the code. We do not print on control codes.

COMMENTS ON LETTER
OF MARCH 5, 1963

3.

The reference you made to red-black printing probably was made because you read somewhere that our tape printers have this feature. We had originally decided that all 128 combinations of the code should be printed on the tape. We also decided to print the middle four columns in black and the four outside columns in red. A little operating experience with this scheme has shown it was an error and we are now changing our tape printers so that they will print only the same characters as our page printers.

7 6 5

109

	(0)00	(0)01	(0)10	(0)11	(1)00	(1)01	(1)10	(1)11
4 3 2 1	Telegr.				Data Proc. ← (CODING) →			
0000	Space				Space	0	)	P
	Escape				Escape	1	A	Q
	CR				CR	2	B	R
	LF				LF	3	C	S
0100	WRU				WRU	4	D	T
	HT				L	5	E	U
	FF				<	6	F	V
	Bell				*	7	G	W
1000	?				J	8	H	X
	National alphabet. characters				i	9	I	Y
					\	.	J	Z
					10	)	K	(
					>	+	L	=
1100	National alphabet. characters				2	CS	M	Apostroph.
					!	—	N	:
					□	/	O	Delete

TELETYPE CORPORATION

5555 TOLUHY AVENUE

Skokie, Illinois

J. F. AUWAERTER
Director of Product Development

April 4, 1963

MR. RICHARD M. MUISE
Minneapolis-Honeywell EDP
151 Needham Street
Newton Highlands 61, Mass.

Dear Mr. Muise:

I have attached a letter and paper sent me some time ago by Mr. Ross of Ferranti, Ltd., London, England, which you might find interesting.

Yours very truly

J. F. Auwaerter
Director of Product Development

JFA:AC

Enc.

CBI 67/1/11

TELEGRAMS
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LONDON

TELEPHONE
LANGHAM 9211

FERRANTI LTD

ELECTRICAL & GENERAL ENGINEERS

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HOLLINWOOD, LANCS
TELEGRAMS
FERRANTI, HOLLINWOOD
TELEPHONE
FALLSWORTH 2000

YOUR REF.

OUR REF. 441/HMcGR/DB.

18th December, 1962.

Mr. J.F. Auwaerter,
Director of Production Development,
Teletype Corporation,
Skokie,
Illinois,
U.S.A.

Dear John,

During the various discussions on Coding, questions have often arisen concerned with the control of errors made by operators, particularly when preparing data for computers. I have prepared a contribution on the subject for the relevant Committee's over here, and I enclose a copy in case you should wish to circulate it to your groups concerned. This has a particular relevance to the definition of some of the terms used in the I.S.O. Coding work, but in fact I have tried to tackle the subject as a whole and to set down the techniques considered useful and important for computer work, where the presence of errors is much more critical than in ordinary typing or message work.

Yours sincerely,



H. McG. Ross
Computer Sales Department

ERROR CONTROL DURING PREPARATION OF DATA FOR COMPUTERS

1. GENERAL INTRODUCTION

This document discusses the techniques for control of errors caused by mistakes by operators during the preparation of data for input to computers. This includes the ordinary alpha-numeric data specially punched on tapes, by-product tapes from office typing, programs, and commands keyed into the computer from a monitoring device. Attention is confined to punched tapes and other continuous media, because these present a more difficult problem than punched cards which merely require initial punching and then verification, any erroneous card being replaced in the pack by a corrected version.

It is useful throughout to consider this error control under two headings - the detection of errors, and their subsequent correction.

Characteristically, operators make one mistake for 200 - 1000 key depressions, the better figure being obtained with routine and repetitive data, and specialist operators.

The great majority of these errors, say 75%, are detected at or soon after the time they occur; the operator puts them right.

To detect the remainder requires a second operation, working again through the data sheets. Several techniques are used, in some the data is keyed again, in others a print-out is proof read or "called over" against the data sheets.

Experience shows that when these errors are being corrected it is all too easy to make further mistakes. Therefore, it is considered most important that at all stages the occurrence of any error, together with its correction, should be high-lighted in some way to permit a third overall scrutiny and check.

In general it is always valuable to have, or to be able to obtain, a print-out of a punched tape. It is considered very desirable that punching conventions be established which have the effect of giving a clear and orderly layout of this document, e.g. each instruction of a program on a new line, or each item of data preceded by Horizontal Tabulate to give spaced out columns. Although these format rules make an extra demand on the operator - being something of little consequence in ordinary typing - they greatly assist detection of errors, and may also be used for a further check when data is input to the computer.

In certain applications, significantly enhanced assistance may be obtained from the computer in the detection of residual errors, e.g. if self-checking features can be incorporated within the data, or for programs if a series of tests be carried out to check that the programming rules and conventions have not been infringed.

In other applications special methods may be used to prepare the data, e.g. the use of contra-entries in banking.

It is not considered good enough to aim that the number of residual errors in the data preparation process be merely similar to that in the original data. Errors in data preparation may be of a different type from those in the data, and the normal office or technical processes may not be designed to deal with them; furthermore, they may cause waste of computer time, or require reference back to the source thus interrupting a computer run.

Errors caused by malfunctioning of the data preparation equipment are regarded as distinct. Experience shows that these usually only arise if the equipment is going out of adjustment, and then become frequent. They are easily picked up on input to the computer by means of a parity check for example.

2. CONTROL OF PRIMARY ERRORS IN A CONTINUOUS MEDIUM

2.1 Introduction

In this Section we consider the control of errors made by an operator, and detected at or soon after the time they occur, in a continuous medium. Typically this is punched tape prepared on tape editing equipment designed for the job. But much also applies to tape punches attached to ordinary office machines, or to magnetic tape (if operator actuated equipment were to be devised), or to systems where time is the continuous factor e.g. telecommunication systems or control devices directly connected to a computer.

The distinctive characteristics are: (i) when an error has occurred it cannot very easily be undone, but must be subsequently corrected; (ii) the error and/or its correction remain in the medium and must be ignored rather than be removed.

2.2 Use of Error Sequence

Probably the simplest practice is to follow an error with a recognisable sequence e.g. EEE or XXX. This is widely used in message telegraphy but is hardly adequate for computer work, if only for uncertainty as to "how far back" is to be ignored.

2.3 Use of Delete in Punched Tape

The commonest practice with punched tape is to move the tape back in the punch and to overpunch the erroneous character and any following correct characters with the all-holes Delete character. These are then re-punched. The Delete character is subsequently ignored.

2.4 Printing of Delete Character

To accord with the computer principle that all errors be highlighted, a printing symbol needs to be associated with the Delete character.

Often a heavy asterisk, suggesting obliteration, has been used but a preferred symbol is reversed shading, see Section 2.5.2 below.

A difficulty then arises with the tape backspace technique of Section 2.3. A print-out during the initial tape punching will show the erroneous character(s), then the Delete symbol(s), and then the correct characters. The rule must be that the Delete(s) refers to the preceding character(s). But a subsequent print-out will show only the Delete character(s) followed by the correct characters, and now a different rule of interpretation applies. In practice this distinction is assisted by printing in red from the keyboard and in black from a tape reader.

2.5.1 Use of Backspace and Delete, with "Line Reconstruction"

A much preferred technique, which is proving very convenient, powerful and adaptable, is the use of Backspace and Delete and "Line Reconstruction" on input to the computer. It will be described in terms of punched tape but seems to be applicable to many other media used with computers.

Consider a manually operated tape punch, with a printer and the Backspace facility which moves the document carriage back one position and punches a Backspace character (BS) in the tape and moves the tape forward as usual. Make the following rules:

(i) The tape and carriage must never be moved by hand but only by the keyboard controls all of which punch characters.

(ii) There should be exact correlation between the appearance of the print-out and the interpretation by the computer of the characters on tape.

The input routine must be written to build up inside the computer a line image of the characters on tape, with one count backwards for each Backspace character. A Delete character is planted over any other character.

Then all Delete characters are ignored.

Note that this technique also embraces that of Section 2.3 because within the computer a sequence of characters on tape which gives an overprinted error on the print-out corresponds to an overpunched error on the tape itself. It is, however, absolutely essential that the Delete character should not be edited out of the punched tape during any intermediate process, but only be ignored inside the computer after the line reconstruction has been carried out. This requirement may be critical in connection with certain data transmission systems.

2.5.2 Independence of Sequence of Characters

It is desirable, and has proved practical, to design input routines so that the method of 2.5.1 is entirely independent of the sequence on tape of the characters appearing within a printed line, and to make it unnecessary for operators to have to follow any prescribed rules of procedure.

E.g. BRITISH STANDARDS INSTITUTION may be punched

as BRITISH STR BS || ANDARDS SP INSTITUTION

or BRITISH STRANDARDS BS BS BS BS BS BS BS BS || SP SP SP SP SP SP SP SP INSTITUTION

where || = Erase character, BS = Backspace character and SP = Space character.

The only complication results from the use of Horizontal Tabulate, and this may be overcome by establishing conventional stopping positions along the line. Any two characters separated only by Deletes are regarded as adjacent.

2.5.3 Use with Carriage Return instead of Backspace

The technique of 2.5.1 may also be used on equipment which has the Carriage Return facility back to the left margin instead of Backspace. Then the operator works along to the erroneous character by Horizontal Tabulate or repetitive Spaces. In the "ISO Draft Proposal Code" CR and BS are thus made alternate meanings of the same character, but it is desirable to establish the meaning between sender and recipient of a message.

2.6 Block Ignore Facility

It is useful, and particularly so for direct connected computer control devices, to be able to ignore a block of data either because it is no longer wanted or because it contains too many errors.

The faulty block may be followed by a correct version.

It is convenient to make the block correspond to a line of printing.

It is considered essential that a printing symbol be associated with the block ignore command. In the "ISO Draft Proposal Code" a character is allocated for this purpose (Error), but it is not yet clear how it will easily be given a printing symbol. Being a single character, it is important that a data character should not unknowingly corrupt into the Error character.

In BS 3480 the sequence Escape X and Newline was suggested to ignore a block.

An alternative sequence prints as crossed parentheses $\emptyset$ and may be punched as Left Parenthesis, Backspace, Right Parenthesis. Using line reconstruction, the rule is made that if this appears anywhere in a printed line, that whole line will be ignored; thus it may be planted in any visible space, and it becomes possible to discard a line which has become too long and jammed up against the right margin stop of the printer.

2.7 The Comment Facility

Related to 2.6. although not strictly to error control, the Comment facility has been found useful. All characters on a line after a distinctive symbol are ignored after input to the computer. Thus comments may appear on program or data sheets to help their understanding, but will not clutter up the computer.

A vertical bar has been used to initiate the comment, or parentheses or square brackets perhaps used in reverse sequence.

3. SECONDARY ERROR CONTROL IN A CONTINUOUS MEDIUM

3.1 Introduction

We now consider the control of errors in a continuous medium which have escaped the primary operator. This requires a subsequent operation referring a second time to the data sheets to detect the errors, and facilities to correct them.

In general, many of the techniques of Section 2 will also be used at this stage.

3.2 Proof Reading the Print-Out

For general work experience shows that the most versatile and convenient technique is to proof read or call over a print-out obtained during the initial keying operation. As errors are found they are marked on the print-out.

The tape is then copied in tape editing equipment, working automatically through correct portions. The new print-out is watched and when near an error the automatic process is stopped. Single-step copying is used up to the last correct character, and corrections introduced from the keyboard. Unwanted characters on the original tape are by-passed manually. Then automatic copying is restarted.

To high-light the corrections, these print in red, while copied characters print in black.

3.3 Tape Verification

Tape verification permits the use of cheaper equipment without printing facilities and is specially applicable to bulk data of a stereotyped nature where the operators can become accustomed to the type and format of the data.

A primary tape is prepared with a Keyboard Punch. Any of the techniques of Section 2 are used for errors detected by the primary operator.

The Verifier comprises a keyboard, tape punch and tape reader. The primary tape having been put in the reader, the verifier operator works from the data sheets and punches a second tape. As each key is depressed it is compared automatically with the corresponding character on the original tape. If there is any discrepancy the keyboard locks, and the operator goes through a sequence of operations to restart and to make sure the second tape is correct.

An ink mark may be put on the second tape whenever there is a discrepancy, to permit subsequent scrutiny as a check on the corrections.

With this method operators have to be able to interpret the coded tape. However, Verifiers with printing facilities are available, although rather expensive.

A subtle difference may be mentioned between this verification of tapes and the verification of punched cards. With cards, the original card is regarded as the basic document, and the punching in it is subsequently verified to ensure that it was done correctly. With tape verification, prime importance attaches to the second tape punched on the Verifier, and its preparation is so to speak regulated by the original tape.

4. REFERENCES

I.S.O. Draft Proposal, 6 and 7 bit Character Codes for Information Processing Interchange, document ISO/TC97/GT B (Sec. 12) 30.

B.S. 3480, Data Processing Codes For Punched Tape.

Tape Editing Equipment, The Ferranti Model 'S' Flexowriter, Ferranti List CS 366.

Creed Keyboard Punch, Ferranti List CS 367.

Creed Tape Verifier, Ferranti List CS 368.

H. P. G. Ross

Berna

April 8, 1963

Mr. Charles A. Phillips
Chairman, ASA Sectional Committee, X3
Business Equipment Manufacturers Assoc.
235 East 42nd Street
New York 17, New York

Dear Mr. Phillips:

Subj: Approval of Draft Proposal on 6 and 7-Bit Character Codes for
Information Interchange

The attached resolution was approved by Subcommittee X3.2 at the regular meeting on April 4, 1963 by a vote of 12 YES, 2 NO, and 1 ABSTAIN. A statement by Mr. Tholstrup in support of his negative vote is also attached. Statements in support of the other negative and the one abstaining votes will be forwarded as soon as they are available.

This resolution is being forwarded immediately since it is Subcommittee X3.2's understanding that the American Standards Association will request that X3 poll its members on this question prior to response to the letter ballot ISO/TC 97 (Sec.-17)44, and that such a polling, while not normally required at this stage, is in anticipation of receipt of a letter ballot on the Draft Recommendation.

Yours very truly,

L. L. Griffin
L. L. GRIFFIN
Chairman, X3.2

Copy to:
Secretary X3.2
Chairman X3 IAC

Atts

316/4
NM 414

RESOLUTION

The X3.2 Subcommittee recommends that the X3 Committee vote YES on the letter ballot ISO/TC 97 (Sec.-17)44 dated February 7, 1963 on the question:

"SHALL THE DRAFT PROPOSAL ON 6 AND 7-BIT CHARACTER CODES FOR INFORMATION PROCESSING INTERCHANGE BE APPROVED AND SUBMITTED TO THE GENERAL SECRETARY FOR CIRCULATION AS A DRAFT ISO RECOMMENDATION?"

The X3.2 Subcommittee further recommends that the letter transmitting the affirmative ballot should state that the United States intends to adopt the 7-bit set for domestic information interchange and strongly recommends the adoption of the 7-bit set for international information interchange.

VOTE RECORD

<u>Name</u>	<u>Representing</u>	<u>Yes</u>	<u>No</u>	<u>Abstain</u>
H. Spielman	Radio Corporation of America			X
A. Ungar	ITT (IEC)	X		
R. M. Gryb	American Tel. and Tel. Co.	X		
W. Y. Lang	Bell Tel. Labs Inc.	X		
L. L. Griffin	Navy Management Office	X		
R. M. Ireland	SCM Corporation	X		
R. E. Blue	IBM Corporation		X	
E. H. Clamons	UNIVAC	X		
J. L. Little	NBS	X		
J. F. Auwaerter	Teletype	X		
A. E. Hassan	National Cash Register	X		
E. V. Budde	General Electric	X		
A. L. Whitman	ITT	X		
H. Tholstrup	EIA		X	
G. E. Williams	Burroughs	X		

Attachment (1)

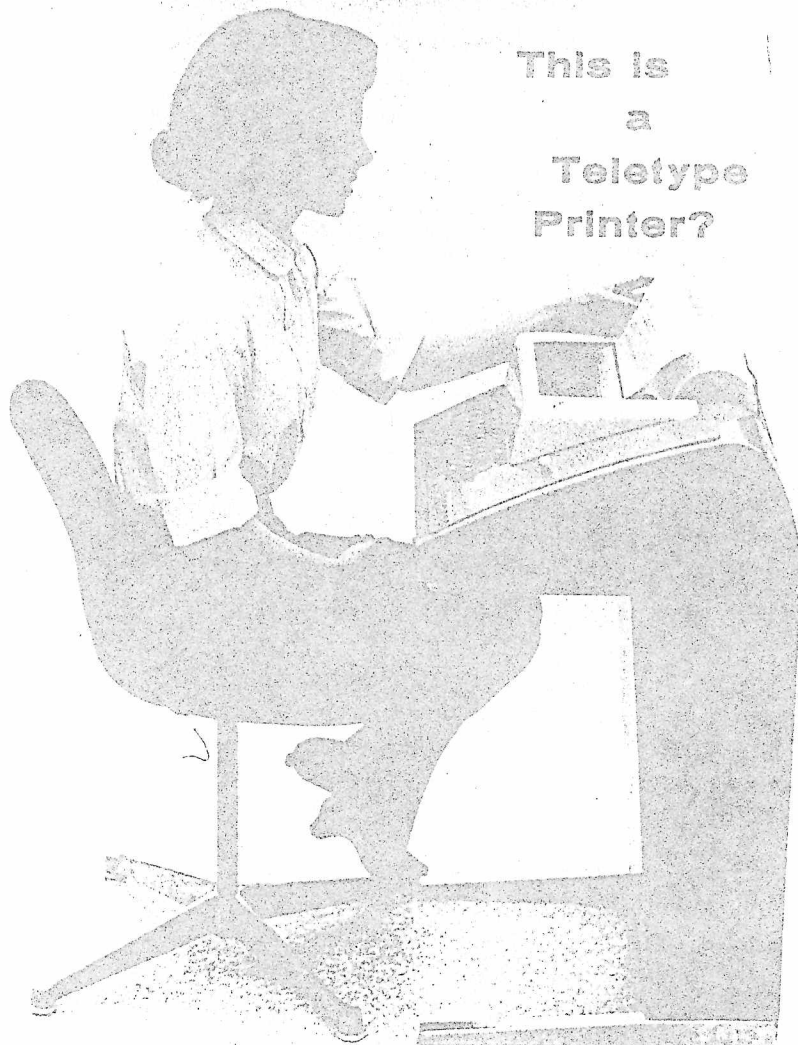
Data ma film
May 63

View through an experimental
heat exchanger matrix.

CIRCLE 35 ON READER CARD

May 1963

p 52



This is a Teletype Printer?

Right! It's the Model 33, a completely new printer made by Teletype Corporation.

If you're wondering what happened to the more familiar one -- we're still building that, too.

You see, we designed the Model 33 to fit a new set of requirements. It has a 4-row keyboard that eliminates shifting for figures and common punctuation marks. This saves operator time, cuts errors and means that every typist in your office can be a competent operator with only a few minutes' instruction.

The Model 33 uses a new 8-level message and data communications code. The 8-levels make it compatible with many computers and data handling systems.

Styling -- while it's just part of what's new -- is smart, functional, and as modern as a man-made satellite. Features include lighted push-button controls, easy paper insertion, and automatic

station identification.

There are three models in this compact, economical "33" group -- the send-receive printer with keyboard, the receive-only printer without keyboard, and the automatic send-receive set with self-contained tape punch and reader.

For users who require a 5-level communications code, there is a new Model 32 group with similar styling and economy.

We would like to send you more information on this new Teletype message and data communications equipment. Contact: Teletype Corp., Dept. 81E, 5555 Touhy Avenue, Skokie, Illinois.

This equipment is made for the full system and others who require dependable communications at the lowest possible cost.



TELETYPE
CORPORATION

CIRCLE 37 ON READER CARD



THE C

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for me. I
McDonnell

**MCDC
AUT**

Division of M
St. Lou
Phone:
CIRCLE

different are Jul 63 p 54
Asell announcement p 55

FIRST CLASS
Post. No. 1012

NEW

FROM:- ECMA Technical Committee 1

TO:- ASA Committee X3.2

TELEGRAMS
DIGIT. WESDO
LONDON

TELEPHONE
LANGHAM 9211

FERRANTI LTD

ELECTRICAL & GENERAL ENGINEERS

21 PORTLAND PLACE
LONDON W.1

HEAD OFFICE & WORKS
HOLLINWOOD, LANCs
TELEGRAMS
FERRANTI, HOLLINWOOD
TELEPHONE
FAIRSWORTH 2000

YOUR REF. JFA/AC.

OUR REF. 441/HMcGR/CPW.

May 3, 1963.

Mr. J.F. Auwaerter,
Director of Product Development,
Teletype Corporation,
5555 Touhy Avenue,
Skokie, Illinois,
U.S.A.

Dear John,

On behalf of the ECMA Input/Output Coding Committee TC1, I have been asked to write to you on the following points for onward transmission to the ASA Committee X3.2.

First, we would advise you that ECMA have now officially approved a standard for a 6-bit character code. I hope to be able to send you a copy of the document very shortly. This standard is based on the ISO draft proposal for character codes for information interchange, and is in fact largely an extract from the document prepared at the ISO October 1962 meeting, of all those parts which are relevant to a 6-bit code. Some of the definitions, however, have been developed with a view to clarifying them rather than changing their meaning. In addition, TC1 have prepared a document, to be published with the standard, on the Philosophy of the Code; this discusses the code and its applications, and describes the aims and purposes which lay behind this work in ECMA.

Secondly, I have been asked to pass on a query - set out on the attached sheet - concerning the meaning of the character Logical End of Medium, which we have been studying in connection with the preparation of an ECMA 7-bit standard code.

Thirdly, I have been asked to pass on the document "Suggestions for Use of Columns 6 and 7 of the 7-Bit Code Table." This is regarded as a working document; comments on it are invited and, it is hoped that it might be augmented by further suggestions in the same area. At this stage it would probably best be regarded as a means to help meet the needs of different users who have special requirements.

We hope this information will be of interest to your Committee and we look forward to receiving any comments.

Yours sincerely,

Hugh

NMAH

310/4

SUGGESTIONS FOR USE OF COLUMNS 6 and 7

OF THE 7-BIT CODE TABLE

1. Introduction

It is considered undesirable at the present time to allocate unique symbols or meanings to all the positions in columns 6 and 7 of the 7-bit code table. However, it is important to avoid the development of a situation where there is excessive variation, with consequent confusion; in particular, it would be unfortunate if, for example, two users requiring similar symbols were to encode them differently.

It is therefore felt that it would be useful to set out several alternative ways of using this area of the code table, primarily as suggestions to users of the code. The choice would of course, require agreement between sender and recipient of data.

The following suggested alternate sets are based on known potential applications of the code, and it is only to be expected that there will be others in future.

2. Lower case letters

Each small letter is in the same row as its corresponding upper case (capital) letter. Hence the only difference between a lower and upper case letter lies in bit 6, and the former may readily be mapped over the latter in the collapse of the 7-bit code to the 6-bit code.

The character in rows 11, 12 and 13 of column 7 may be used for lower case letters in alphabets with more than 26 letters, or for accents or diacritical marks.

Alternatively, in certain systems or equipments, lower case letters may be obtained with a second shift, using the same coded characters as capital letters.

3. Superscript or subscript numerals

Each superscript or subscript numeral would be encoded in the same row as its corresponding numeral in column 3, and hence related to the binary coded decimal value of its 4 less-significant bits. By extension, this allows superscript numerals up to 15 as single characters and printing symbols (for possible use in fractions, see paragraph 4.1).

On certain keyboard equipment it may be convenient if these supplementary numerals are paired with letter keys. In consequence, if zero is required it will be preferable to encode these numerals in column 7. Thus, for example, superscript numerals zero to nine, together with subscript ten (which may be required in some programming languages as the base of logarithms) may conveniently be paired with the keys for letters P to Z. By use of half-line-feed on printing equipment, superscript numerals can be printed as subscripts (for suffices or in mathematical tables, for instance).

- 4.1. Each fraction is encoded so that there is a relation between the decimal value of its numerator and the 4 less significant bits of its binary coded form.

Fractions are encoded primarily in column 6, which permits single-character symbols up to 15 in the sixteenths-series, and makes it possible in certain keyboard equipment to pair the fractions with the letter keys A to O.

- 4.2. Superscript fraction numerators. Superscript numerals for the numerator will be of value to give a clear form of printing fractions, and will distinguish the latter from whole numbers.
- 4.3. Fractions reduced to lowest terms. These would be encoded as in 5.1, but for the printed symbols the fraction is reduced to its lowest terms. Each fraction would be a single character and printed graphic. As an example, the chart shows the eights-series of fractions.

This arrangement presupposes that in any one application there would be only one series of fractions, e.g. only eights, not both eights and thirds.

5. Supplementary programming symbols

Certain programming languages may require more special symbols than those provided in the standard set in columns 2 and 3. It is suggested that these may be conveniently encoded in column 6 because, then, 15 symbols may be paired with the capital letters A to O on keyboard equipment. Furthermore, it is possible to have the superscript numerals and base 10 of logarithms as well (paragraph 3).

Further work is required to choose a set of such supplementary programming symbols, and to decide their positions in column 6.

ECMA Technical Committee No. 1
Input and Output Codes.

May 2, 1963.

COLUMN ROW	LOWER CASE LETTERS (SEE PARA. 2)		SUPER-SCRIPT NUMERALS (SEE PARA 3)	SUB-SCRIPT NUMERALS	LOWEST-TERMS FRACTIONS (SEE PARA. 4.3)	PROGRAM-MING SYMBOLS (SEE PARA 5)	SUPER-SCRIPT NUMERALS
	6	7	6	7	6	6	7
0		P	0	0			0
1	a	q	1	1	$\frac{1}{8}$		1
2	b	r	2	2	$\frac{1}{4}$		2
3	c	s	3	3	$\frac{3}{8}$		3
4	d	t	4	4	$\frac{1}{2}$		4
5	e	u	5	5	$\frac{5}{8}$		5
6	f	v	6	6	$\frac{3}{4}$		6
7	g	w	7	7	$\frac{7}{8}$		7
8	h	x	8	8			8
9	i	y	9	9			9
10	j	z	10	10			
11	k	④	11				SUBSCRIPT 10
12	l	④	12				
13	m	④	13				
14	n	Escape	14	Escape			Escape
15	o	Delete	15	Delete			Delete

↑
15 SPECIAL PROGRAMMING SYMBOLS
↓

May 2 1963

BRIEF REPORT
Meeting of CCITT Working Party on the New Telegraph Alphabet
May 13 - 15, 1963

At its Second Plenary Assembly, the CCITT decided to setup a Working Party consisting of study Groups I (telegraph operation), VIII (telegraph apparatus) and Special A (data transmission) to study a "New Telegraph Alphabet." The first meeting of this Working Party was held in Geneva, Switzerland on May 13 - 15, 1963 and was attended by the following countries and organizations:

Australia	Netherlands
Belgium	Sweden
Canada	Switzerland
France	United Kingdom
Germany	United States
Italy	International Standards Organization
Japan	World Meteorological Organization

Messrs. Ross and Durand attended representing the ISO. The author of this report attended as part of the A. T. & T. Co. (U.S.A.) Delegation.

The CCITT, for some years now, recognized certain limitations in the present 5-level, alphabet No. 2. Some progress on the question of a new alphabet was made at the Warsaw meeting in 1958. Through liaison with ISO and through the work of Special Study Group A, there has developed sentiment within the CCITT that perhaps a new telegraph alphabet should be suitable for both data transmission and message telegraphy. The present group had before it the 6- and 7-bit code proposal resulting from the Paris meeting of ISO TC 97 in October, 1962.

The three day meeting based much of its work on the ISO 7-bit code proposal. The group generated a list of 135 required telegraph and data transmission signals (which were subsequently reduced to 123), generally expressed itself as inclined toward a 7 level code, disagreed on the structure which a code should assume (although the consensus appeared in favor of the ISO 7 bit structure), summarized the results of their work in a table similar to that of the ISO 7-bit proposal, planned to forward the results of its work (on a preliminary basis) to the ISO and decided to ask its constituent members (telephone and telegraph administrations) to express their opinions on the preliminary work results.

Among the points made during the meeting were the following:

1. There was no immediate or even foreseeable need to abandon or modify the present 5-level network. However, in choosing a new telegraph alphabet it is desirable to consider the needs of these public services as well as of more specialized (e.g., data) services.
2. A 7-level code is desirable because it permits a second alphabetical case for teleprinter use without the need of a mode shift. Experience with the 5-level alphabet has indicated a mode shift is undesirable.

CBI 67/1/11

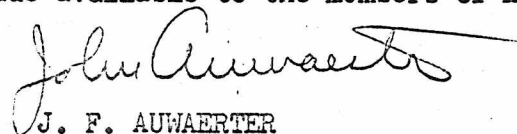
3. The Warsaw convention had served to reduce the number of special diacritical signs and the number of special national signs to 5 each. The diacritical marks required are ` / ^ " ~ , while the national signs would consist of both non-Roman alphabetical characters and special symbols.
4. A first inventory totaling 135 requirements (the "data" requirements were those in the ISO 7-bit set which the CCITT felt no need for) was developed and is attached to this report.
5. The representatives of ISO stated that there were certain parts of the 7-bit code which were "softer" than others and which were, therefore, more readily subject to replacement by substitute symbols. These were (in order of "softness"):
 - i) The three characters binarily contiguous to Z (since these are pre-empted in the Scandinavian alphabet extension)
 - ii) The characters ↑ ← @
 - iii) The symbols ! " # CS (currency sign). The ISO representatives said they could not speak officially for the ISO in this matter but made these suggestions on the basis of their own knowledge of the field.
6. By taking advantage of the ISO suggestion the group was able to reduce what they felt to be the combined requirements and ISO and CCITT to 123 symbols.
7. The United Kingdom suggested a code structure quite similar to that of the ISO 7-bit proposal, with a number of pre-emptions for diacritical and national signs; but these suggested revisions differed from those of the ISO representatives.
8. The United States (A. T. & T. Co.) offered a code structure which was essentially identical to the proposed ASCII.
9. Germany offered a code proposal which consisted essentially of a 6-bit code containing both graphics and controls but set within the right hand (upper binary) half of a 7-bit matrix. This proposal was modified twice during the meeting to bring the 6-bit sub-set into closer agreement with the 6-bit ISO proposal. The left hand (lower binary) half of the set was devoted one quarter to controls, one quarter unassigned and one half to a second alphabetical case.
10. The German proposal met with limited acceptance.

11. A chart was prepared showing the results of the meeting's work. This chart was similar to the proposed ASCII except in the following details:

- i) A lower case alphabet was placed in the Unassigned Area.
- ii) The "Acknowledgement" signal was removed from its present location (without being assigned to any alternate permutation) in order to make room for lower case non-Roman alphabetical extensions.
- iii) The areas suggested by the ISO representatives (See Paragraph 5 above.) were indicated reserved for national signs and diacritical marks.

12. This chart will form the basis of further work and of a report to the ISO.

The above report may contain errors because of the reporters unfamiliarity with the procedures of the CCITT. When the final CCITT report is published it will be made available to the members of X3.2.



J. F. AUWAERTER
International Representative, X3.2

JFA:JZ

	Common demands of Telegraphy and Data Pro- cessing		Additional Demand of Telegraphy		Additional Demand for Data Pro- cessing		Demands for transmission	
	Demandes communes à la télégraphie et au traitement des données		Demandes supplémentaires pour la télégraphie		Demandes supplémentaires pour le traite- ment des données		Demandes pour la transmission	
Lettres 1er choix Letters (first choice) (second choice) 2ème choix	26+espace (space)	Nb 27		Nb	CS	Nb 1		Nb
	-----	-----	26	26				
Chiffres et signes Figures and signs	figures, chiffres - ? : () • , ' = / + } % ;	10 11 2	Signes diacritiques Diacritical signs /\ ^ . ~	5	! # " & * @ < > [] \ / ↑ ←	13		
Fonctions Functions	Bell BS HT CR LF FF VT DC1 ... DC4 Error, DEL LEM SYNCHRO	1 6 4 2 1 1			NL SO, SI, ESC DLE ISO ... IS7	1 4 8	SOM EOA EOM EOT WRU RU ACK	7
Usage National seulement National use only		3		2				
Total Total general = 135		68		33		27		7

Appendix G

Report on Task Group X3.2.4

Meeting time and place: June 11, 1963, Pentagon Building,
Washington, D. C.

Attendance: R. M. Muise W. Y. Lang
A. L. Whitman W. F. Huf
L. R. Turner E. J. Lewis
O. R. Arne A. F. Jones
E. H. Clamons, Chairman J. L. Little
J. G. Doyle J. F. Auwaerter

Papers distributed:

ECMA TC-1 to ASA X3.2 - H. McG. Ross, Ferranti, Ltd.
to J. F. Auwaerter

Draft Proposal for Joint Action by X3.2.4 and X3.2.6
by L. R. Turner

Brief report meeting of CCITT Working Party on the
New Telegraph Alphabet, May 13-15, 1963

Suggested Code Assignment and Keyboard Layout for
ASCII Format for Typesetting Applications dated
June 10 by O. R. Arne

Sample Print-out from a special IBM 1403 Printer
with Over-printing by L. R. Turner

Page 178 of GPO Style Manual

The meeting was opened by a ruling of the Chair. The resolution
which had passed at the previous meeting which stated that the
lower case alphabet was to be placed in the unassigned area
would be considered as valid, notwithstanding the subsequent
resolution of the X3.2.6 Group to the contrary.

Mr. O. R. Arne of Mergenthaler Linotype Co. presented the
requirements of the graphic arts industry in the use of line-
casting machines and proposed a method by which the code could
be adopted to their use.

Mr. L. R. Turner of NASA presented a paper on the need for
additional characters and control definitions.

Mr. J. F. Auwaerter of Teletype introduced the brief minutes
of the meeting of CCITT and communications from ECMA regarding
the extension of the code and possible changes to the code.

R. E. UTMAN

JUL 12 1963

BEMA/DPG

Report on Task Group X3.2.4 (continued)

Assignments were made as follows:

Messrs. Auwaerter, Clamons and Little to produce a
rationale in favor of placing the lower case alphabet
in the unassigned area

Messrs. Lewis, Muise and Whitman to draft arguments
for placing additional controls in the unassigned
area

Messrs. Turner and Lang to investigate the use of
"ACKNOWLEDGE" and its possible relocation into another
area

Eric H. Clamons

EHC.dg